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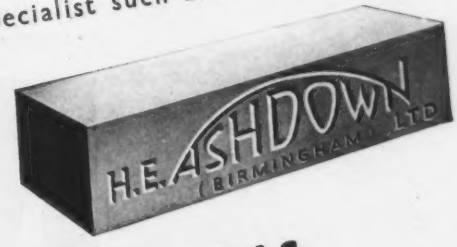

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Continued on page vi

6. THROUGH LIFE WITH BX PLASTICS

The first anniversary of Peter and Prudence's wedding has been duly celebrated and followed by a domestic stocktaking. How well the plastic things are wearing! Most of them you'd think were only bought last week. And the same with the car—plastic parts still perfect though elsewhere there are distinct signs of age. "Have to be thinking about a new 'bus next Spring" says Peter, surveying it a little ruefully. "I shouldn't be in too much of a hurry" says Prudence, "you may have to be buying perambulators and a good many other things by then!"

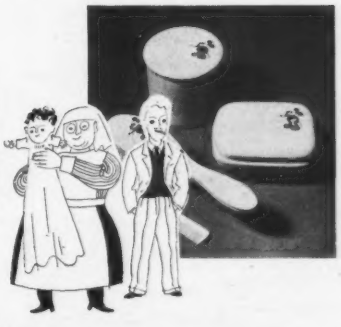
1 Fountain pen, pencil, and dress ornaments.

Prudence's sewing machine and Lactoid knitting needles are working overtime. There's an air of secrecy, even expectancy, about the house. Mrs. A. C. Tate came to stay—and has stayed five weeks. Peter is a little restive and worried these days.

2 Thimbles, knitting needles, rattle, etc.

The Peter Peabody's baby is the most remarkable child in the world. Has its Father's nose and its Mother's good nature. And—really—quite a lot of hair. Must get a hair brush and comb—one of those Xylonite Baby Sets. And so the world goes on . . .

★ ★ ★ ★ ★



3 Bexoid baby set.

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DIRECTORY OF THE INDUSTRY

CONTINUED FROM PAGE iv.

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BRITISH INDUSTRIAL PLASTICS, LTD., IDEAL HOUSE, ARGYLL STREET, LONDON W.1

Plastics

Dealing with the Manufacture, Uses and Potentialities of Plastic Materials.

Vol. II. SEPTEMBER, 1938 No. 16

Index to Advertisers.

Ashdown, H. E. (Birmingham), Ltd. .. i.
Ashworth & Meredith, Ltd. .. .. xiv.
Bakelite, Ltd. .. .. x.
Birkbys, Ltd. .. Inside Front Cover
Bridge, David, & Co., Ltd. .. .. —
British Celanese, Ltd. .. .. .. —
British Cellophane, Ltd. .. .. —
British Industrial Plastics, Ltd. .. viii.
British Rototherm Co., Ltd. .. .. —
British Xylonite Co., Ltd. .. .. v.
Catalin, Ltd. .. .. xiii.
Crystalate Mouldings .. .. .. iii.
Danks of Netherton, Ltd. .. .. xvi.
Dowding & Doll, Ltd. .. .. .. —
Ebonestos Industries, Ltd. .. .. —
Ellison Insulation, Ltd. .. .. xv.
Erinoid, Ltd. .. Inside Back Cover
Expanded Rubber Co., Ltd. .. .. —
Firth, Thos., & John Brown, Ltd. .. —
Gardner, Wm., & Sons (Gloucester), Ltd. xiv.
Hamburger, M. .. .. —
Herbert, Alfred, Ltd. .. .. .. ii.
Higgs, G. N. .. .. xvi.
Injection Moulders, Ltd. .. .. —
Lorival Manufacturing Co. (1921), Ltd. xii.
Manesty Machines, Ltd. .. .. xvi.
May & Baker, Ltd. .. .. .. iii.
M.C.L. and Repetition, Ltd. .. .. xvi.
Mollart Engineering Co., Ltd. .. —
Moulded Products Ltd. .. .. —
Mouldrite, Ltd. .. .. xi.
N. B. Mouldings, Ltd. .. .. .. —
Norcross Panel Plywood Co., Ltd. .. —
Permastic, Ltd. .. .. —
Phipps Plastic Products Ltd. .. .. xiv.
Prestware, Ltd. .. .. vii.
Pulsometer Engineering Co., Ltd. .. —
Ray Mouldings, Ltd. .. .. .. —
Rootes Mouldings, Ltd. .. .. ii.
Steele & Cowlishaw .. .. .. xiv.
Synthite Ltd. .. .. —
United Glass Bottle Mfrs., Ltd. Back Cover
Young & Wolfe .. .. xvi.

Announcements.

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TEMPLE PRESS LIMITED
Proprietors, Printers and Publishers of "The Motor," "The Light Car," "The Commercial Motor," "Motor Cycling," "Cycling," "The Motor Ship," "The Motor Boat," "The Oil Engine" "The Aeroplane," "Light Metals," and "Chain & Multiple Store."

5-17, Rosebery Avenue, London, E.C.1

Other notices appear on last page.

CONTENTS

	PAGE
Editorial	287
Radio-Plastics	289
General Release	290
Ecclesiastical Uses for Plastics	292
1938 British Packaging Awards	294
Plastics in a Heat Wave	296
Ideas, by the Editor	297
Research, Not Accident	299
The New Sunbeam Talbot	304
Laminated Sheet for Electrical Purposes, by E. E. Halls	306
Higher Speed Grinding	309
Rubber in the News	311

Production:

Notes and Comments	313
Inquiries and Answers	315
Trade and Personal Notes	316
New Materials—New Plant—New Methods	317
Patents	318

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Vol. II. No. 16 SEPTEMBER, 1938

Plastics

Dealing with the Manufacture, Uses and Potentialities of Plastic Materials

Proprietors - - TEMPLE PRESS LIMITED
Managing Director - ROLAND E. DANGERFIELD

Editor - - M. D. CURWEN, B.Sc., A.I.C.
Offices - 5-17, Rosebery Avenue, London, E.C.1

PLASTICS AND THE MOTORCAR

REPORTS from a number of sources tell us that the motorcar with a body made of plastics is now a commercial proposition in Germany, and that it is this car, very low in price, which Herr Hitler hopes even the working class will possess. And since it is a good thing for the populace of crowded towns to move towards the open spaces in the country and towards the sea in their leisure hours, we presume that the possession of a car is much to be desired. Luckily, Germany is large enough, and many of its roads are sensibly constructed to take a greatly increased traffic load.

It would not be very amusing, however, in this country if the £50 car became a reality, and new car owners raised the number on the road by, say, 50 per cent. Automobile road construction has sadly lagged behind the economic development of the car and is without doubt hindering the industry. There is little pleasure in possessing a car when it takes from half to one hour to get out of London. And one cannot, therefore, desire to see the really cheap car here until this present state of affairs is considerably improved. We should have the roads before the cars.

Nevertheless, if the car with the plastics body is upon us it is interesting to speculate on its make-up.

We have frequently described the incidence of plastics in the British car. Window frames and instrument sections are not new and have appeared in the Hillman Minx and the Ford Ten. In this issue we publish elsewhere the latest developments in the Sunbeam Talbot, in which the first complete moulded facia-board makes its appearance. Gear wheels in the driving parts and in the window-wiping mechanism, windows and many hidden parts are produced by our industry. But as for the body itself, that is another pair of shoes, although many in the automotive industry have dreamed fond dreams of pressing complete bodies in one fell swoop. The problem is not only that of the type of material to employ, but also one of pressing. It would, indeed, be a courageous British manufacturer who would be prepared to throw overboard his huge and costly steel presses to invest in a new set of a different type for pressing plastic plates. The Germans, on the other hand, have never desisted from attempting large-scale experiments in any industry, and to their profit.

As for the material used, it may be interesting although not very valuable to speculate upon. It would be more important, however, to design a new type of car based on plastics without following the usual metal design. We presume it would be on these lines that success would be attained. At present it seems that the most likely base is a resin impregnated-laminated material or, possibly, a moulding stuff made from flock impregnated with resin using an emulsion. The laminated material appears more reasonable, especially since a new development by Bakelite, Ltd., is the production of laminated plastics in shaped forms. This recent advance we discuss on another page. With this in our mind's eye, we can readily see the construction of curved and angular sections for the body, while shaped mudguards, etc., appear real possibilities. The cellulose acetate mudguard is, of course, simple and has already been constructed. We readily agree that no plastics are as strong as the metals used for constructional work, but it does not seem to be beyond the ability of automobile engineers to construct a car in which, what we now call the body, should be a shell and which, although strong, did not take on excessive burden. One can also visualize the construction of a new type of door, perhaps of the sliding sort, made of plastics, the closing of which does not necessarily include the crashing slam that loosens most of the screws and bolts in the car.

Many manufacturers are now examining plastics seriously and are becoming acquainted with some of their possibilities and characteristics. In the earlier days it appears that plastics were regarded by this industry merely as a possible means of avoiding painting a car.

A development of special interest is that by Warerite, Ltd., of Ware, Herts, who are producing an impregnated hardwood sheet of very low weight and low cost. This material is extremely attractive for the construction of panels for heavyweight commercial lorries, the taxation of which is regulated according to weight. There is, perhaps, a more important attraction to lorry builders, since while the 2½-ton lorry is limited to 30 m.p.h., the 3-ton lorry is limited to a mere 20 m.p.h. There is money in lightness and there is money in speed.

Radio-plastics

WE confess that when we visit Radiolympia it is not with the intention of finding out what press-button tuning is, nor particularly how the cathode-ray tube is applied to the new science of television. We can get all that from our young nephews and nieces, aged ten or thereabouts, who seem to talk as if Professor J. J. Thomson had confided to them his latest secrets. What is so dreadful is that they seem to understand what they are talking about. No; our peripatetic wanderings are merely to find out how far plastics have attracted the manufacturers and what improvements have been made in plastics design.

We also search for colour which is almost as rare as the dodo.

It is worthy of note that there are only two materials for the construction of radios—we deal here only with the outer casing—wood and plastics. And although wood is employed to a much greater extent than plastics, yet it is noticeable that the proportion of plastic radios used this year is larger than last. So much to the good. There are six large manufacturing concerns who make a great feature of them—E. K. Cole, Ltd., Ferranti, Ltd., General Electric Co., Ltd., Mullard, Philips and Pye. Many others make plastic radios in a smaller degree. Each of the above-named companies issue three or more, so that more than two dozen were on view.

On the whole, all the sets are beautifully constructed, as a glance at our special page of photographs will show, and, as an example of highly skilled moulding technique, no adverse criticism is possible. But it is a sad sight to see that almost in every instance the plastic radios are practically replicas in design and colour of the wooden cabinets, that is, they are merely attempts to imitate mahogany, walnut and so on. What great opportunities are being missed are obvious when we examine the new Ekco "Pick-me-up" set which is designed in blue and cream and with the knowledge that the best of plastics can be made by considering them as new materials of construction and not as mere substitutes for wood. Special commendation is due to Pye, Ltd., who also treat plastics as they really deserve. Incidentally, the Crystallate "roll-top" we give publicity to in this month's "Ideas" page is employed in the Pye Model 808 as a shutter. Both colour and ingenuity are in this set.

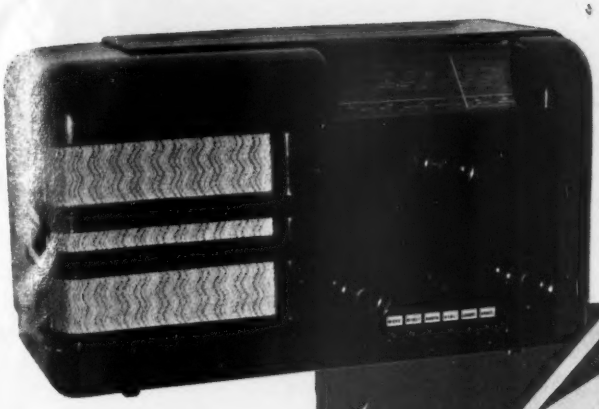
JUST TO REMIND YOU

Comparisons are considered odious. Perhaps they are, but it is often important to thrust home the progress we make on the road to what we think is something better. Generally, in these pages we make comparisons by words only, or by data which may or may not mean much. But it is often more important to give visual effect to an argument, for seeing is so often believing.

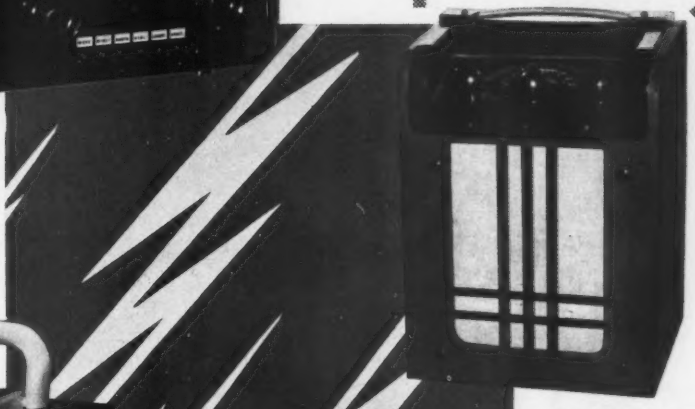
An idea has been passed to us for the delectation of our readers by Mr. N. B. Punfield, of that well-known company of moulders, Punfield and Barstow, Ltd. Its very simplicity was probably the cause of our not seeing its utility before. It is to show pictorially an object in its old form in pre-plastic days and by comparison its new form in plastics. Mr. Punfield sends us the first comparison—a screw-top lid of a hair-cream pot—one in plastics and that which it replaces in metal. Both are red in colour, the former in solid red amino plastics, the latter red paint on metal which is showing through.

Punfield and Barstow, Ltd., have moulded this lid of red amino resin for Csborne, Garrett and Co., replacing the metal one.

RADIO-PLASTICS 1938

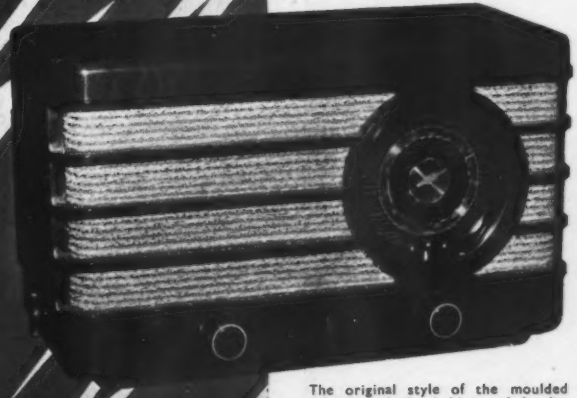


This new Ferranti set, known as model 514 PB, has a moulded cabinet of modern design in dark walnut finish. Another interesting feature about this "Prestune" all-wave superhet is the three knobs made of transparent plastics. This particular model retails at 14½ guineas.

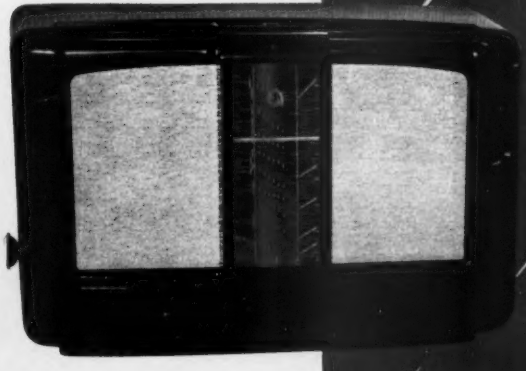


For those who want a neat, compact midget portable receiver, equipped with newly designed frame aerials and weighing only 14½ lb., then the Pye model 808, selling at eight guineas, is just the thing. One most interesting feature of the set is the moulded roll-top cover to the control panel, which can be locked.

The "Pick-me-up" set made by E. K. Cole, Ltd., which sells at £7 19s. 6d., owes a great deal of its attractiveness to the moulded grid frontage in light and contrasting amino resin. The moulded carrying handle alls into position and streamlines with the cabinet when not in use.



The original style of the moulded cabinet and the boldness of the distinctive circular dial, with station names clearly indicated, convey an impression of power and quality. Probably this is the reason why Philips Type 40 is attracting so much attention. It is essentially a popular set and for A.C. mains costs only eight guineas.

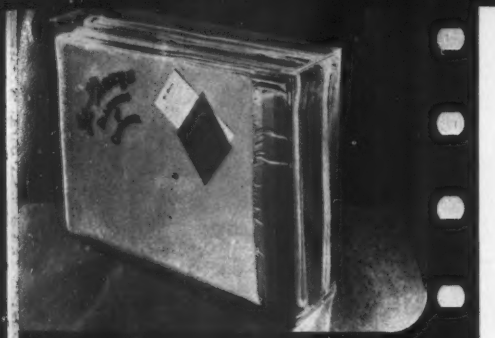


A combination of handsome appearance and "acoustic design" makes this Mullard moulded receiver, Mas 15, a focal point for radio fans. The set is a 5-valve superheterodyne and has a new Mullard noiseless H.F. pentode and cathode ray tuning indicator. The retail price is 10 guineas.

Here's a very popular G.E.C. set, A.C.5, which has a walnut-finished Bakelite cabinet and extremely effective "chromoscopic" tuning dial, calibrated in station names and wavelengths. At £7 19s. 6d. this two-band five-valve superhet for A.C. mains represents excellent value.

"General Release"—I

New and Interesting Plastic Goods



THE item illustrated in the above photograph won first prize in the All-America Packaging Competition for 1938. The package itself is made of Lumarith Protectoid, the transparent packaging material made by Celluloid Corp., New York, U.S.A.

MODERNISTIC car mascots in Catalin are distinctive and give a touch of opulent luxury to even the humblest roadster. These particular examples are in deep ruby crystal Catalin and bright chromium.

THE candelabra illustrated are manufactured in Scarab by J. S. Peress, Ltd., for the chain stores market. They are constructed in parts retailing at 6d. each and can easily be assembled by the veriest tyro. The lampshades shown are moulded in Beetle.

PLASTACELE cellulose acetate, one of the more recent plastics to enter the field of fashion, is seen in a decidedly high style use in millinery in this striking sports hat. The wide brim is carried out in the plastic in a rich deep green. The turret crown and front tie with long streamers are in green combined with rich red and yellow. The hat, designed by Louisesanders, is to be had in a variety of other colours.

PLASTIC cabinet handles and drawer pulls are now very popular and a number of prominent furniture manufacturers are using them in preference to die castings. Lacrinoid, Ltd., who are experts in this line, are the moulders of the examples illustrated.

THIS is another type of container made to hold astringent pads and very popular in the United States. General Plastics, Incorp., have sent us this example, which is moulded of their famous Durez phenolic resin.

General Release"—II

New and Interesting Plastic Goods

THE two razor boxes in maroon colour mottled with black, shown in the foreground, are moulded of amino resin powder by Rolls Razor, Ltd., and used instead of the all-metal type of box in the background of the photograph. The big feature of the moulded box is that the size has not been increased, the wording and decoration being recessed so as to fit in the standard razor case. The inside of the box is ribbed to support the blade in either position and save it from damage.

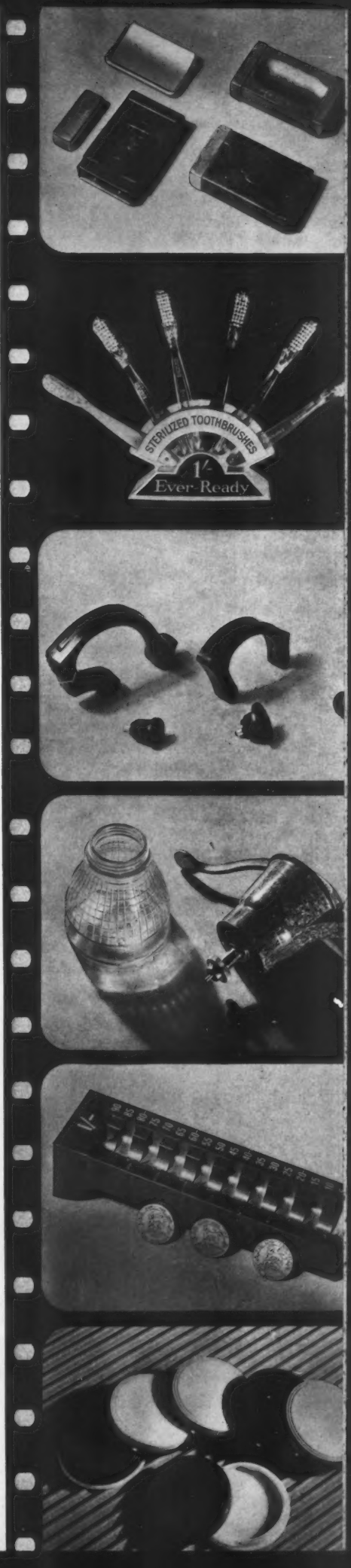
THIS ingenious and attractive moulded stand for Ever Ready toothbrushes was produced from amino plastic, Mouldrite U.F. quality, by Prestware, Ltd., the well-known Merton concern, who specialize in display units.

ALUMINIUM cooking utensils are now generally equipped with plastic handles and the examples shown above are considered to be the most serviceable for domestic use. They are moulded of Bakelite for the hardware trade by Precision Plastics, Ltd., Birmingham.

CREAM making presents no difficulty to the modern housewife when she possesses one of these efficient devices. This well-known domestic appliance, called the Bel cream maker, is equipped with a moulded Bakelite cup into which is poured the hot mixture of butter and milk. Cleaning offers no difficulty as all the parts can be washed and dried separately and, of course, Bakelite is absolutely hygienic and immune from deterioration of any kind.

THE Coindex Cash Counting Tray moulded of Bakelite is popular with shopkeepers, business houses and booking offices because it is both simple and practical. Precision Plastics, Ltd., of Birmingham, are the moulders for the patentees.

THESE dainty containers for astringent pads have been sent to us by the American moulders, Colts Patent Firearms Manufacturing Co., Hartford, Connecticut. They inform us that the containers are completely unaffected by the astringents used to moisten the tissues and give every satisfaction in use. Materials used for moulding are Coltrock, the phenol formaldehyde resin and also the amino plastic.



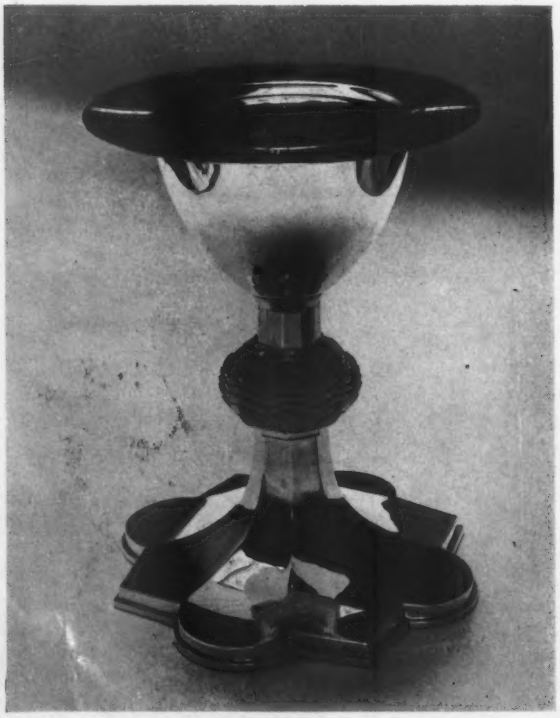
ECCLESIASTICAL USES FOR PLASTICS

In church and school large numbers of religious ornaments are to be found and it is suggested that many of these could be made of plastics

ALTHOUGH it might at first appear that plastics find little, if any, use in church, it is interesting to record that carved resins, mouldings and hand-worked panels of such materials as Plexiglas, Lucite and Perspex all find varying applications.

Some of the most interesting examples of mouldings of a religious character are made in America by the Gorham Co., Rhode Island. They are made of a number of different materials, but Plaskon is a general favourite, because in the light shades it becomes a new medium in the hands of designers specializing in ecclesiastical work.

Not only are these moulded religious ornaments in great demand for use in churches, chapels, schools, hospitals and public institutions, but they enjoy a considerable popularity with the Middle West farming



This silver chalice was designed by A. Edward Jones.

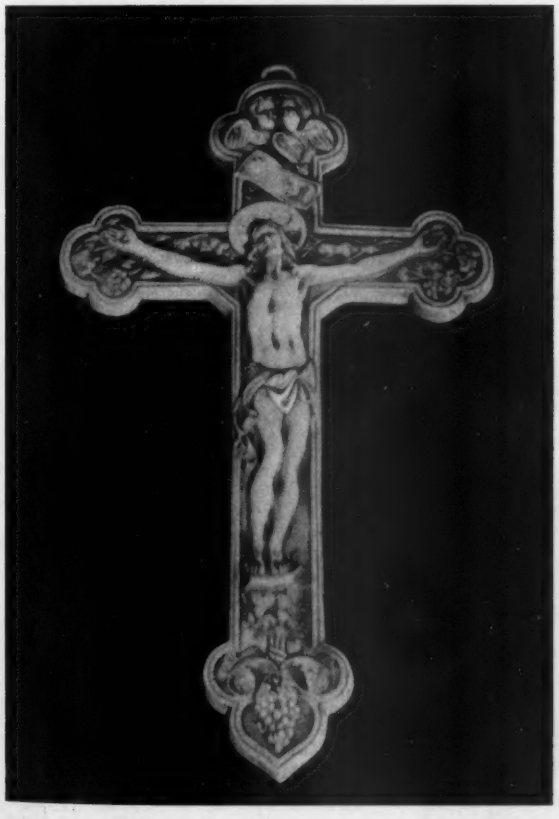
Churchwarden's stave designed by R. Faulkner.

ommunity. Plaques always represent a remunerative line for moulders, and there seems no reason why these should not be made more attractive by the skilful use of inlaid designs, or designs built up of two or three parts moulded in different colours and stuck down to the base with a suitable adhesive. Incidentally, moulded medallions and beads for rosaries are now made in large quantities both on the Continent and in America. They command a relatively high price and there is always a healthy demand.

In association with silver, cast resins such as Catalin and Marblate are often used for decorating chalices, maces and various other altar pieces. Colours closely resembling ivory can be obtained, and there is also available a wide range of very beautiful shades, many of which harmonize exceedingly well with silver. No difficulty need be experienced in working with the cast resins, which can be cut, sawn and drilled with ordinary tools, and lend themselves readily to accurate and very intricate work. There is no reason why plastics should not be widely employed by craftsmen specializing in church work, and, of course, on a price basis the synthetic materials are a great deal cheaper than ivory.

In a private chapel in America there are four carved panels directly over the altar made of Plexiglas. The designs, which represent stations of the Cross, are chiselled out of the sheet and look as if they were acid etched. These panels owe a great deal of their effectiveness to the concealed lighting, which is transmitted uniformly throughout and gives a mysterious and exceedingly impressive appearance.

Apart from the use of plastics for church ornaments,



This Crucifix of Plaskon was moulded by the Gorham Company, of Rhode Island, and is rightly considered an excellent piece of work.

Plaques are always in demand by religious communities and this moulded example is representative of many thousands made in America to-day.

they can also be utilized for certain furnishings. Moulded lampshades of translucent amino plastic are worthy of consideration by ecclesiastical authorities. They have several advantages over the ordinary flashed opal, as they are lighter, transmit more light for less current consumption, and if they do fall there is no risk of injury to the congregation.

Plastic Foils

According to the *Manchester Guardian Commercial*, August 5, 1938, a number of new foils made from synthetic resins and other materials are engaging the attention of electrical engineers.

Laminated foils are made from vinyl chloride polymerization products and serve for direct insulation of electric wires or as protection against outside influences. Drawn foils are made from polystyrol, which alone can be made into very thin foils and finds an outlet in telephone insulation, where its good electrical properties are much appreciated. Cast foils are used for high-voltage and low-voltage cables and are recommended for purposes where protection against moisture is required.

New Composite Materials

Considerable interest is now being taken in the production of composite materials made up of such plastics as cellulose acetate or polyvinyl resins adhering to solid backing materials. A recent patent covers a process of producing metals with a plastic covering film by adhering polyvinyl layers to the metal base with a film of chlorinated rubber, which acts as a cement. In an example, an iron surface is sand blasted and three coats of a solution of chlorinated rubber in 570 parts of mesityl oxide applied followed by three coats of a solution of 100 parts of polyvinyl chloride, plasticized with 25 parts of tricresyl phosphate in 875 parts of mesityl oxide. Another patent deals with a method of bonding cellulose acetate to such material as paper, metal, foil or rubber with special adhesives.

1938 BRITISH PACKAGING AWARDS

"Having found its feet, British packaging begins to go somewhere".

IN spite of rising costs, the last twelve months have been a year of intense activity in package design.

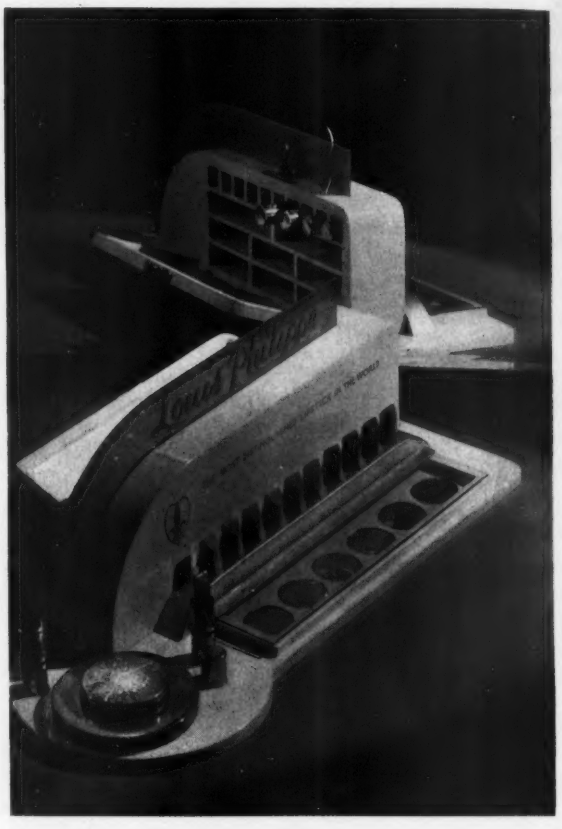
The growth of interest in packaging among makers of proprietary products is shown by the fact that, for the second annual Awards for British Packaging, organized by the magazine *Shelf Appeal*, entries were twice as numerous as in the previous year's contest.

More than 850 packs were submitted. As many were entered under several classifications, something like 2,500 separate decisions had to be taken by a panel of judges.

General level of craftsmanship shown by the entries was, report the judges, extremely high in some classifications, extremely poor in others.

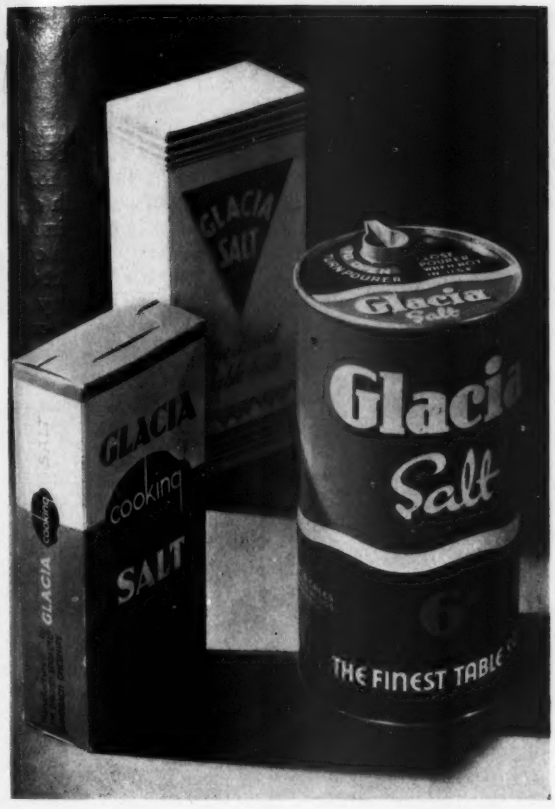
The section which pleased the judges best by reason of its technical standard was that which might be called package engineering, or the study of the consumer's convenience. In the packing of such intractable products as gramophone needles, doilys, paper handkerchiefs and salt, ingenuity was concentrated on solving problems which cause the consumer much irritation.

Because packaging and display are so closely related, three classifications were allotted to counter displays. Not only were entries vastly more numerous than in the previous year, but the standard was extremely high.



The Silver Award for the most outstanding display of selling unit in wood, metal or plastics for packaged goods was given to Louis Philippe, Ltd., for their original cosmetic stand, which was designed by C. H. Jacobs, of Efox, Ltd. This display of white cellulosed wood with red lettering combines a show of moulded plastic lipsticks with a cabinet, at the back, containing actual lipsticks for testing purposes, accessible to the shop assistant, and a row of rouge testers covered with a hinged strip of cellulose acetate. The carved strip at the top is also of acetate, with gold lettering.

An Award of Merit for a package designed for consumer convenience went to T. J. Smith and Nephew, Ltd., for Elastoplast adhesive plaster. It was designed by Mr. J. H. Castell and moulded by Prestware, Ltd., the firm responsible for so many excellent display units. The container is extremely ingenious and the flat shape of the spool enables plaster to be wound off easily and without stretching the fabric. Incidentally this new pack is contributing greatly to new sales records.



Silver Award for most outstanding package designed for consumer convenience was presented to British Soda Co., for their Glacia Table Salt. It was designed by John W. Gardener, and the colour scheme is white lettering on blue and black which gives it a kind of nautical appearance. The patented moulded pouring device serves also as a closure and is held in place by a cardboard disc in the top of the fibre can.

The judges report "constructional ingenuity, new materials, lettering, illustration have all been exploited, and exploited well. Display, the winners indicate, is getting out of the showcard-cutout stage into something more carefully thought out, more efficiently planned to sell instead of merely to be seen."

Summing up, the judges' verdict on the progress of packaging and display in the last twelve months is that "manufacturers and designers are getting down to the serious business of merchandising, instead of being preoccupied with appearance and sheer purity of design. Having become package-conscious, British manufacturers are beginning to realize that a pretty package is not necessarily a selling one, that a redesign scheme is, by itself, no guarantee of improved business, that there are cases when clean design becomes dead and characterless, and when a little down-to-earth workmanlike lack of the finer æsthetic points is very desirable. British packaging, in fact, having now found its feet, is beginning to go somewhere."

In a review of the winning packages one is immediately struck by the fact that not only are plastics receiving more consideration as efficient and smart materials for the mass production of containers and display units, but that the designer realizes that they can be made to harmonize extremely well with metal, wood and fibre and so enable him to produce striking results at an economic price.

Where the manufacturer using plastics scores over his competitors is in being able to produce modern-looking packs in bright and really permanent colours at a high rate of production and minimum cost. He is confident in the knowledge that the public like plastic goods not only because of their smart looks but for their durability under all conditions of use.

Award of Merit for a gift package to John Burgess and Son, Ltd., for their ingenious and practical pickle cruet. The plastic and metal stand is recessed to hold three moulded glass jars of pickles, the carton serving as a display base. The Streetly Manufacturing Co., Ltd., moulded the stand in coloured Scarab. The tray and handle are connected by an upright chromium-plated rod and the moulded portions are available in green, yellow and red.

PLASTICS IN A HEAT WAVE

IN many parts of America heat-wave conditions of over 90 degrees in the shade continue unabated throughout the summer months. Naturally, this places a heavy strain on a large number of working people who are not all able to earn their living in properly air-conditioned buildings. Heat slows down both mental and physical agility and often causes nausea, dizziness and general muscular exhaustion.

According to competent medical authorities, heat sickness is due mainly to the loss of salt from muscular tissues due to heavy sweating, and the only way to make good the deficiency is to take small amounts of pure sodium chloride during the working period of the day when bodily exertions are at the maximum.

In factories, offices and many public buildings in America it has long been realized that there exists a need for compact and economical devices for dispensing small tablets of pure salt for human consumption. The Fairway Laboratories, Inc., of St. Louis, Missouri, specialists in medical supplies and manufacturers of sodium chloride tablets for the prevention of heat sickness, realized that there was a promising market for a really efficient dispenser, but they were faced with certain very difficult problems in its manufacture. First of all, the dispenser had to be produced at a minimum cost and with the entire internal mechanism able to resist the corrosive action of salt, and also prevent the entry of moisture and dust. Then, again, the material of construction had to be absolutely permanent and yet possess a durable finish.

"FAIRWAY"
SODIUM CHLORIDE TABLET
A PREVENTIVE OF HEAT SICKNESS
MANUFACTURED BY
FAIRWAY LABORATORIES, INC.
BELLEVILLE, ILL.
TABLETS AND DISPENSER - PATENT APPLIED FOR
TAKE ONE TABLET AT A TIME
WITH A SWALLOW OF WATER
SWEATING AN EXCESS OF SALT FRO
MUSCULAR TISSUES IS THE GENER
CAUSE OF CRAMPS, NAUSEA, DIZZINES
AND GENERAL MUSCULAR EXHAUSTIO
REPLACING THE SALT LOST BY THIN
ONE OF THESE "FAIRWAY" TABLET
ONE AT A TIME TO A TOTAL OF FOUR T
SIX DURING THE WORK PERIOD
PREVENTS THESE EFFECTS
FAIRWAY LABORATORIES, INC.

After a careful survey of the entire range of available materials, it was decided that only plastics fulfilled all the conditions of service, and so arrangements were made with Chicago Molded Products Corporation to produce an all-plastic dispenser of exceptionally sturdy construction and yet compact in size and light in weight. The necessary protection against moisture and dust was achieved by extremely accurate moulding and finishing of the component parts. The top of the container, which fits snugly over the hopper, is equipped with a knob which conceals a simple locking device operated with a key. A window of transparent Lucite, the methacrylate resin made by Du Pont de Nemours, tightly fitted by ingenious grooving, shows when the supply of tablets is running low.

The base is moulded in two sections, so perfectly fitted that they appear as one. A groove at the top of the base fits snugly around the flange at the bottom of the hopper. The tablets are released one at a time into the spout at the bottom of the dispenser by merely turning the knob directly connected to a simple dispensing disc. The window of transparent Lucite which covers the spout shows when the tablets can be taken.

The result is a simple, durable device, capable of giving splendid service under the varying conditions encountered in busy industrial plants. The opaque material used is wood-flour Bakelite, which is highly resistant to corrosion, and the only metal used is in the connecting screws and eyelets.

PLASTICS GO TO SCHOOL

MOULDED inkwells of special shock-resisting phenol formaldehyde resins are now being widely used in a number of London schools. So far experience shows that they withstand the rough and tumble of school life far better than those made of pot and they are completely unaffected by the action of ink.

Apart from the use of plastic inkwells, several other applications of synthetic materials are now being discovered which promise to assume a considerable degree of importance in the future. In France, maps, original paintings, architectural drawings and diagrams are being made permanent by impregnating with amino resin and subsequently heating under pressure to form stiff board-like sheets which can be bonded on to plywood bases.

Laminated material is used for walls, table tops and even the tops of laboratory benches instead of teak, and moulded transparent lampshades substituted for those of flashed opal. Incidentally, it would be a sound idea if dioramas could be constructed showing the manufacture and most important applications of plastics. These could be on a smaller scale to those in the Science and other London museums, and would undoubtedly be of considerable educational benefit.

Ideas—

By the EDITOR

Tobacco Containers

It has been said that if the general public were to create a desire for plastics, or, at least, to interest themselves in our products, the plastics industry would go ahead like fun. I was, therefore, extremely pleased to receive a visit from Mr. F. Taylor, of Welwyn Garden City, a printer by trade, who expressly visited me to see what I could do to further one of his desires. He is one of those pipe smokers who buys his tobacco in ready-made rolls. Apparently, there are a very great number of such pipe smokers who never use a tobacco pouch. The rolls are sold in packets of one dozen, the thin cardboard packet ($3\frac{1}{2}$ by $2\frac{3}{4}$ by $\frac{3}{4}$), in general, being a poor thing to retain them in. Mr. Taylor wants a moulded box to hold them, and I believe it is a moulded box that would not only prove very acceptable, but amenable to sensible design. There is, so far, nothing on the market. By far the best suggestion would be for the tobacco manufacturers to have them made and distributed "buckshee" to their customers at, say, yearly intervals.

Inlaid Mouldings

This is certainly Crystallate day. Crystallate, Ltd., have sent me examples of two new developments which deserve special mention. The first is one which we have long hoped to see, viz., the production in this country of synthetic resin mouldings inlaid with metal. As our readers will remember, we published some remarkable examples of the possibilities of this process in our February, 1938, issue.

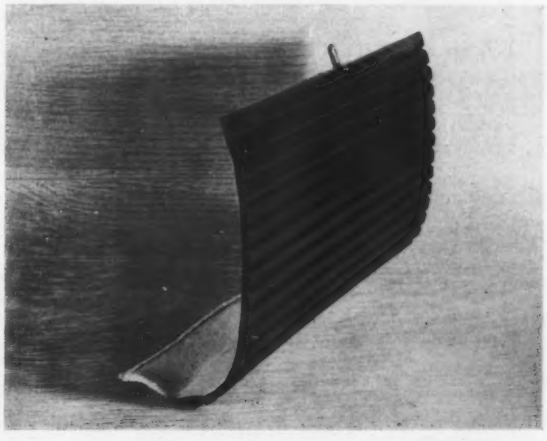
The photograph I reproduce here shows a clock frame

inlaid with an aluminium decoration impressed with a coloured design of a fleur-de-lis. We understand that numerous designs of inlays are available and advertisements can also be supplied. The colours in the frame shown are Wedgwood blue base, green leaves and red flower on the silver colour of the metal. I have often urged the inclusion of metal in mouldings when employed as an artistic medium, and hope that this movement will prove successful. I even look forward to the day when gold and silver will be moulded not only with the usual coloured mouldings but also with transparent Beetle and Perspex.

Plastic Roller Shutters

The second example of Crystallate ingenuity is a completely new idea so far as I am concerned. Roller shutters of plastics open up a completely new line of manufacture and will, I hope, serve further to convince manufacturers in all industries of the versatility of plastics.

As will be seen, the moulding is carried out in units of two strips, the space between units allowing for flexi-



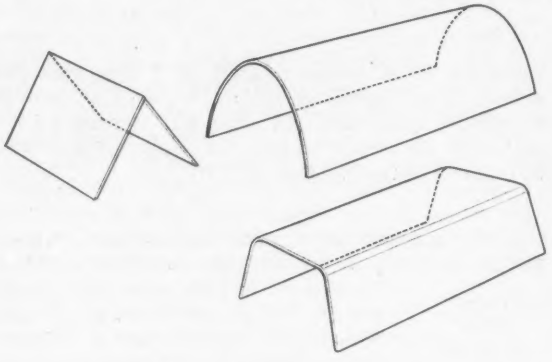
bility of the whole. The moulded sections are backed with strong canvas. At first I thought some amazing strong adhesive had been used to fix this backing, since I could not pull it away. On closer examination, I see Crystallate, Ltd., have been far more intelligent, for the resin is actually moulded into the canvas, forming an inseparable whole. The shutter is extremely strong and looks as if it will stand up to any amount of hard usage.

Bringing up Lettuce

I was watching, some time ago, a market gardener tending his seedlings and persuading them to grow faster by placing what is called a "cloche" over them. These "cloches" are of glass, the modern cheap ones no longer being bell-shaped, but are constructed from two square sheets of glass held together by metal wire at an angle of. say, 100 degrees to 110 degrees. While watching I saw him put his foot through one of them and, judging from the movement of his lips, I presume he was regretting the fact that glass is breakable.

It struck me that here there seems to be a reasonable outlet for "cloches" made from sheet celluloid or acetate. Moreover, it would be quite simple to form

what should be more acceptable shapes than those already in existence. It would be possible, too, to make them longer and still be lighter than those made of glass. The present angular cloche sheets are only about 1 ft. square. Made from plastic sheet, a 3-ft. length would be quite manageable and would need no



metallic wire to carry them about. The drawing on the left shows the existing glass cloche.

In winter they could be stacked in closely packed piles and would suffer very little damage.

To-day's Problem

What do you do with your old razor blades? This earth-shaking problem (purely a rhetorical one, of course,) has worried savants ever since Mr. Gillette arose and cut swathes in the hirsute appendages of the bucks of the early years of the present century. To-day it even worries the blade manufacturer.

Confront a friend with the question and ten to one a blush mounts his cheek or a look of terror enters his eyes. Most will confess to a shocking laxity in dealing with a problem that has only recently been tackled seriously, for the thin slivers of steel need careful handling when they no longer serve their legitimate purpose.

There are, we know, many illegitimate uses. I myself possess a cunning little combined comb and hair-cutting apparatus with which I crop my scottie. The apaches around Marseilles had the tidy habit in the old days of fastening them to their sleeves and using them against their dear old pals, the gendarmes. Others cut corns, sharpen pencils, or prune roses, and there are dozens of other home-made devices which eat up a goodly number of cast-offs. But the matter does not end there. What happens to the cast-offs when they in turn are cast-off? We cannot just throw them away in the dust bin. Or rather, we can, but what of our conscience? I remember doing it once and dreaming all night of gallant dustmen cutting their delicate fingers; I had to get up, wrap it in a little envelope, and write "Blade, with care," on the outside.

Some appear to allow the blades to repose on the top shelf of the medicine chest, where they remain and rust and stain until a goodly number are collected and are then buried in the garden in the dead of night.

Within recent days there has been a real attempt on the part of razor-blade manufacturers to save our faces and to provide us users with a little box in which to put our blades when they have served their several uses. The idea is, perhaps, not new, but the early attempts were miserable little "tin" boxes that rusted and were so badly designed that the blades did not fall in properly and prevented others entering.

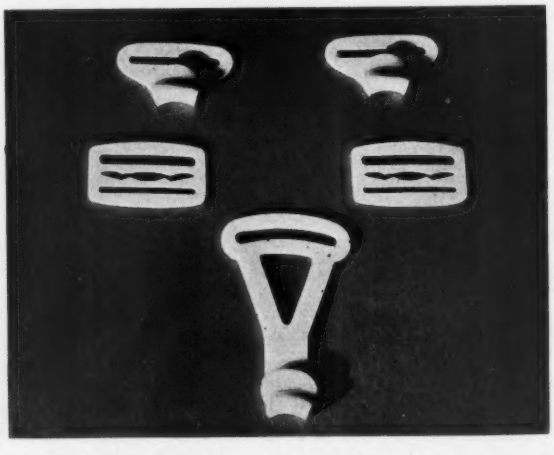
To-day it is realized that even men like an attractive and intelligently made gadget and, what is more important, that they like the aforesaid gadget free, gratis and for nothing. The manufacturer, moreover, sees that the answer to the problem design, colour and cost lies in plastics. At least, one manufacturer does.

Thomas Ward and Co., makers of the famous Wardonia Safety razor blade, have plunged in and produced an excellent device (photograph herewith) that is attractive in design and colour, and withal, holds a spare packet of blades. Made in amino resin, it is presented gratis to Wardonia customers.

So the good work begins, and judging by the questions put to me at the B.I.F. this year by a representative of Gillettes, we shall eventually see another.

Keeping Up Appearances

A kind reader back from Paris has sent me a complete set of the wherewithal in plastics to make my own braces. Sold under the trade name of San-Couture, they are described in the pamphlet as being unbreakable, select, solid and supple; directions are given how the ordinary man in the street can make his own braces by simply slipping a length of fabric through the



runners and the supports. Personally, I refuse to make my own braces, but I wish the manufacturers would adopt these ivory-like beauties. By his braces is the really elegant man known!

Measurement of electrical resistivity both surface and volume.

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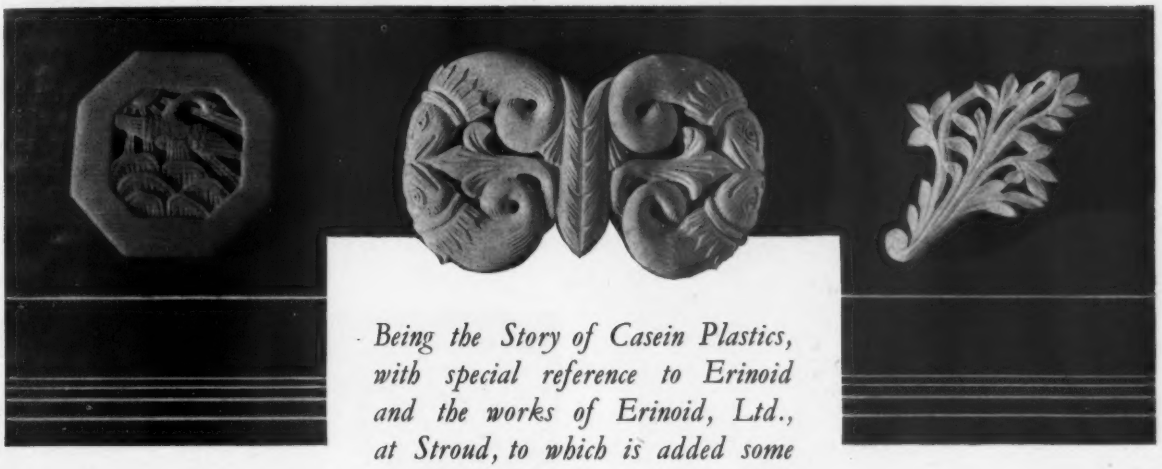
RESEARCH—NOT ACCIDENT



Being the Story of Casein Plastics, with special reference to Erinoid and the works of Erinoid, Ltd., at Stroud, to which is added some details of the more recent developments of this company, namely the production of Cellulose Acetate and Cast Phenolic Resins

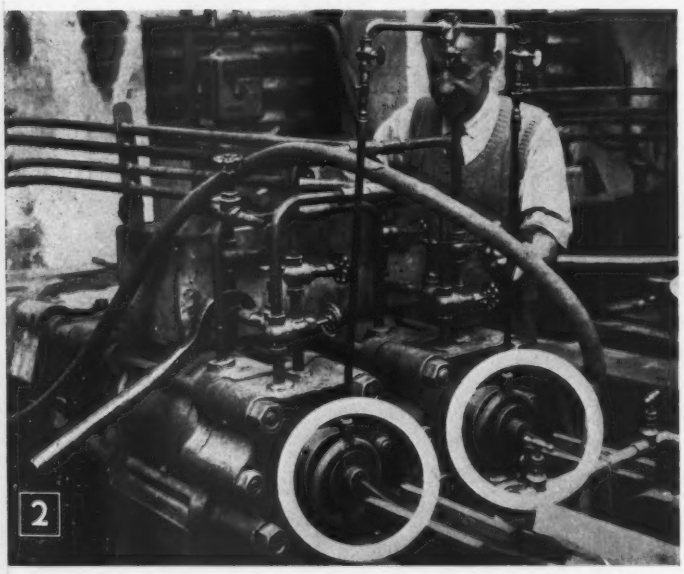
IT seems strange to reflect that most people imagine that nearly all inventions have come about by sheer accident. Moreover, they receive considerable enjoyment from this thought, at least, judging by the frequency with which our daily papers make such reports.

In actual fact most discoveries or inventions are the result of nothing but hard work and understanding of that work. It is true that many accidents have given rise to discoveries, but without a knowledge of the work leading to the accident and of the results of the accident, it is probable that no discovery would have resulted at all. Thus although it is highly probable that the ordinary man in the street has often been in the presence of an accident which might have led to a discovery, nothing results owing to the lack of appreciation of what happened.

A new method of making indigo dye was discovered by the accidental breaking of a thermometer in a flask, the mercury hastening considerably a certain reaction. But this was carried out in a laboratory in which all that happened was understood by the chemist. The rare gas argon, ultramarine and X-rays were all "accidentally" discovered, but in all instances the accidents took place in the presence of someone who either realized immediately what was taking place or who saw a phenomenon that required elucidation and investigation.

It is, therefore, to be understood why scientists are apt to smile when it is stated in the daily papers that casein plastics were discovered by a druggist who accidentally upset some formaldehyde over a piece of cheese in his mouse trap. Apart from the fact that very little would happen to the cheese in a short space of time and that the druggist would not note any change at all, it is more likely that he would go on his knees, wipe the mess up, and forget all about it.

No, the story of casein plastics is much more interesting. The material, like other discoveries, appeared on the market only after much hard work. The story as given in "Chemistry in Commerce" tells how in 1897 a German firm were anxious to produce white boards for writing on for school use. A chemist named Spitteler, although he failed to produce the desired article, succeeded in obtaining from milk casein a material which was so tough and resembled horn so much that it was termed synthetic horn. When it was found that the new material could be shaped and cut readily, and, moreover, could be coloured with dyestuffs, the scene was set for its production on a manufacturing scale. It



first appeared on the market under the name of Galalith, and in 1913 manufacture by Erinoid, Ltd., was begun at Stroud, Gloucestershire.

Casein, as is already well known, is present in cow's milk, the material for casein plastics manufacture being made by treating skimmed milk with rennet, separating the precipitated casein, washing and drying. Stroud had, therefore, been selected by Erinoid, Ltd., because it was the centre of large grazing districts and it was hoped that milk would be plentiful. Unfortunately at that time the country could not supply sufficient, and casein was obtained from France, the Argentine and New Zealand. More recently, however, such concerns as United Dairies, Ltd., Cow and Gate, Ltd., are now producing high-quality material in quantity in England.

The then failure of home-produced casein, fortunately, had no ill-effect on the industry, which rapidly went ahead. Indeed, the installation of the factory in such delightful surroundings provided one of the most important desiderata for such work, namely, cleanliness. It is, in truth, a rarity among factories.

Casein plastic has long made itself a place in industry with very good reason, and has kept it because of its workability, strength, low cost, non-inflammability, and perhaps above all because manufacturers have produced such a bewildering variety of beautiful designs and colours. From many points of view few materials can replace casein plastic in the fancy goods trade.

1.—The mixing machines showing the mixing of casein powder, dyes, etc.

2.—The extrusion machines. The nozzles from which the extruded material issues are encircled in white.

3.—The platen presses and moulds being prepared. In the foreground is a pressed sheet.

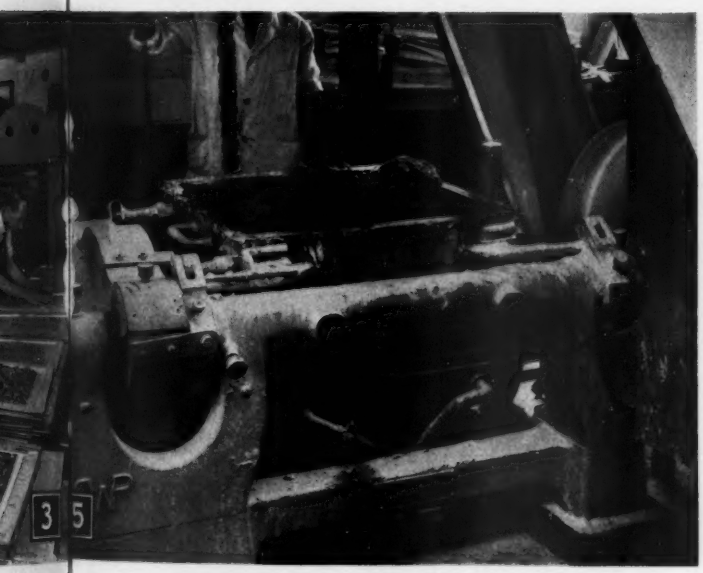
4.—The hardening tanks containing formaldehyde into which the cradles containing Erinoid rods, sheets, etc., are lowered for curing.

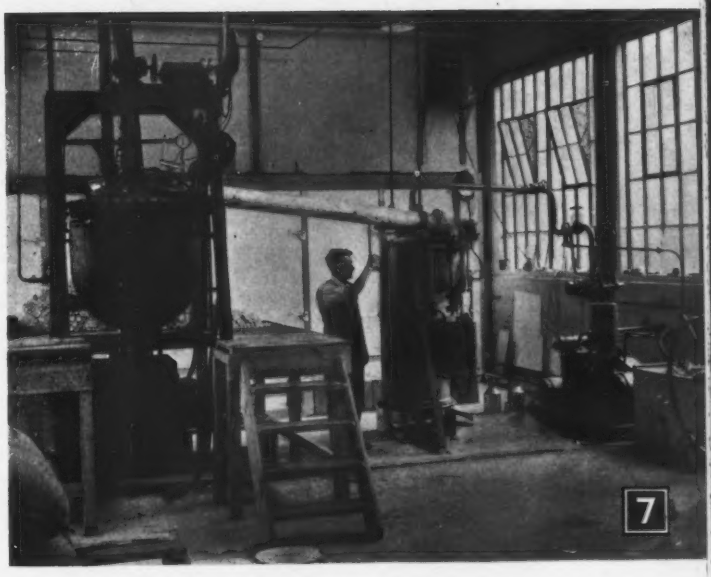
Buttons, brooches, combs, umbrella handles, brush-backs, knife handles, cases, fountain pens and so on are the great outlets for the material. When dry it has good electrical properties and finds some outlet for low-tension work. It naturally has its limits in application, since it swells slightly on absorbing moisture, and is obviously not used where expansion must be avoided.

The casein as it arrives at the Stroud factory is in the form of pale yellow dry granules, which are ground into a fairly fine powder. The first major operations are the swelling of the casein with water and its colouring with pigments or dyes. Both are carried out in the one mixing vessel, which is similar in construction to a dough mixer. A 132-lb. charge of casein is fed in with the pigments and any necessary plasticizers. This is thoroughly mixed for some 20 minutes, and then about 30 lb. to 40 lb. of water, in which the necessary dye is dissolved, is sprayed on to the mixture. It is interesting to note that some of the plasticizers, in addition to helping in the ultimate plasticizing processes, confer translucency to the material.

The casein mixture thus obtained is not pasty, but is in the form of a damp powder. It is the raw material for the processes that follow.

The mixed and dyed casein is then fed into the hopper of an extrusion machine, which consists of a feeding screw suitably heated to maintain the casein in a plastic condition and which forces the material





5.—A typical cellulose acetate mixer in which plasticizing of the raw acetate takes place.

6.—Rolling and sheeting of cellulose acetate.

7.—A complete plant, vacuum still, condenser and vacuum pumps for producing cast resin.

8.—Casting pure liquid phenol-formaldehyde resin into lead moulds to produce sample rods and other shapes.

through fine grid into the head of the machine. From this head it is squeezed further and takes the form of the nozzle, which may be circular or oblong and from which it finally issues hot as a rod or strip to be cut off into desired lengths. If a tube is required a mandrel is inserted in the nozzle. So much for the production of a simple rod or tube, and if this is the form finally required, they are then passed to the hardening tanks, which contain a 5 per cent. solution of formalin.

Sheets are produced from the above extruded material in ribbon form by placing lengths of strip in moulds with loose sheets of metal on top and underneath. The moulds are then loaded into platen presses, which are then closed and heated to cause the casein to flow. On cooling and extracting, the sheets are also passed to the hardening tanks. It may be noted that if the casein were not treated with formalin it would rapidly deteriorate and prove useless. Formalin hardens and stabilizes the material. The treatment varies according to the thickness and may take days or months.

For the production of sheet or rods of strongly contrasting designs the procedure changes slightly. For example, in the production of imitation tortoise-shell we have a very dark or black design on an almost transparent base, and the black must not flow or "bleed" excessively into the latter. Thus we begin with two powders, one for the pale yellow transparent base and the second a black powder. The latter is first extruded into very thin black rods about 5 mm. diameter, which is then chopped into small nibs 5 mm. long; these are then air-dried according to the design required, for the harder the nib so will the design be more defined.

These nibs are then mixed with the base powder which, it will be noted, has not been previously extruded, and placed in a sheet mould. Since the nibs have already been processed they plasticize less readily, and the dark design stands out boldly against the translucent amber-coloured background.

Such a sheet may be worked again in a "pinching" press into rod form, the individual rods being cut apart and, if necessary, drilled to form fountain-pen units.

After "formalizing" the rods, sheet, etc., are washed in water to remove excess formalin, and then dried in cupboards maintained at 90 degrees F. When the plastic leaves these drying cupboards it is quite stable and ready for "sanding" and polishing.

Acetate and Cast Resin

With the advent of cellulose acetate, some few years ago, as a non-inflammable "celluloid," Erinoid, Ltd., quickly realized its possibilities both in the sheet form for cutting and shaping and in the powder form for the new injection moulding process. A special section in the works deals with the production of both these materials, the raw acetate being mixed with plasticizers and colours in heavy Baker-Perkins mixers, and then rolled to produce sheets up to 1 mm. in size. The advance made in sheet production at this works may be gauged by the brilliant example of hatched design we gave in our Ideas page last month. Special grinding machines produce the powder for customers engaging in the injection process.

Most recent in these works is the erection of a new plant for the production of cast phenol resins. This development has taken place only in the last few months and has now reached the stage of large-scale production. The resin is marketed under the name of Erinoplas. In one of the accompanying photographs is seen one of the special vacuum stills employed for the manufacture. Very pure carbolic acid and formaldehyde are pumped into the distilling vessel, which is then sealed and heated under high vacuum. The comparatively low temperature at which the reaction is carried out produces a colourless resin, which on slow cooling and under carefully controlled conditions solidifies to a tough glasslike mass. Colours can, of course, be introduced.

In practice the liquid resin as it is drawn from the still is filled into lead moulds of varying shape. On solidification the rod or tube is extracted from the mould for sale to fabricators, who cut and carve the casting as required. This resin, then, offers great opportunities to the ingenious and artistic. A long tube, for example, can be cut into short lengths which become serviette rings, or thick sheets may be cut by fret-saw into letters and other intricate designs.

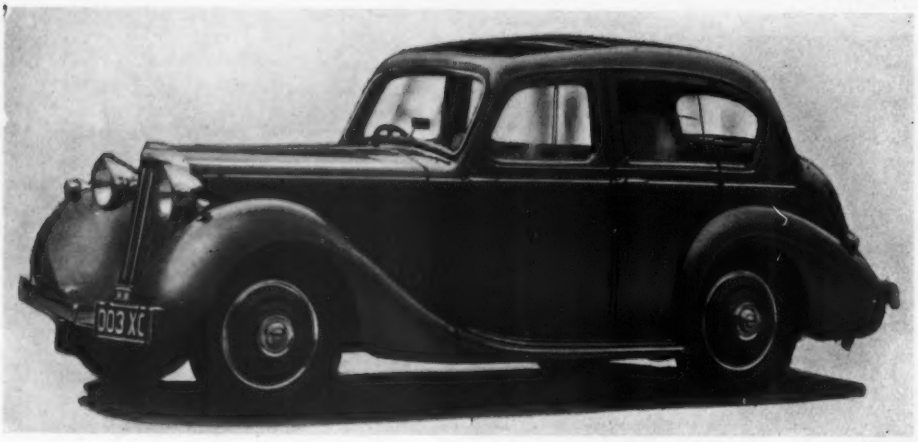
We have long looked to cast resin to become the medium for real artistic manipulation and carving, and have often wondered how long it would be before artists accepted it as an equal in beauty with ivory and marble.

Without further comment we present to our readers on the opposite page reproductions of the most artistic carvings we have yet seen made from solid block cast resins.

The symbolic fish was carved by George Taylor, of 29, Warner Road, Hornsey, London, N., and the Venus was carved in the works of Morris and Forndran, 56, Ruston Street, London, N.1. Both were made from Erinoplas, which, although quite unlike ivory or marble, possesses a singular beauty and texture of its own. Our readers will agree that the work is highly meritorious.

Venus, hand-carved from Erinoplas in the workshops of Morris and Forndran, Ltd., the well-known ivory workers.

On right, a hand-carved symbolic fish of Erinoplas. Carved by George Taylor, Esq.



THE NEW SUNBEAM TALBOT

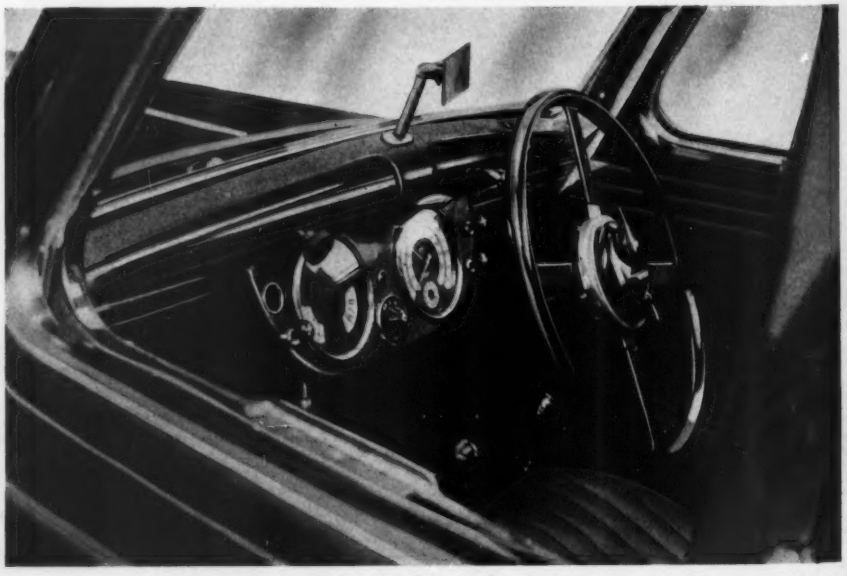
And Its Plastic Facia-board

WHEN we returned last year from the November Motor Show at Earls Court, we bowed our heads and wrote a rather despondent article on the attitude of British motorcar manufacturers towards plastics and colour, especially colour.

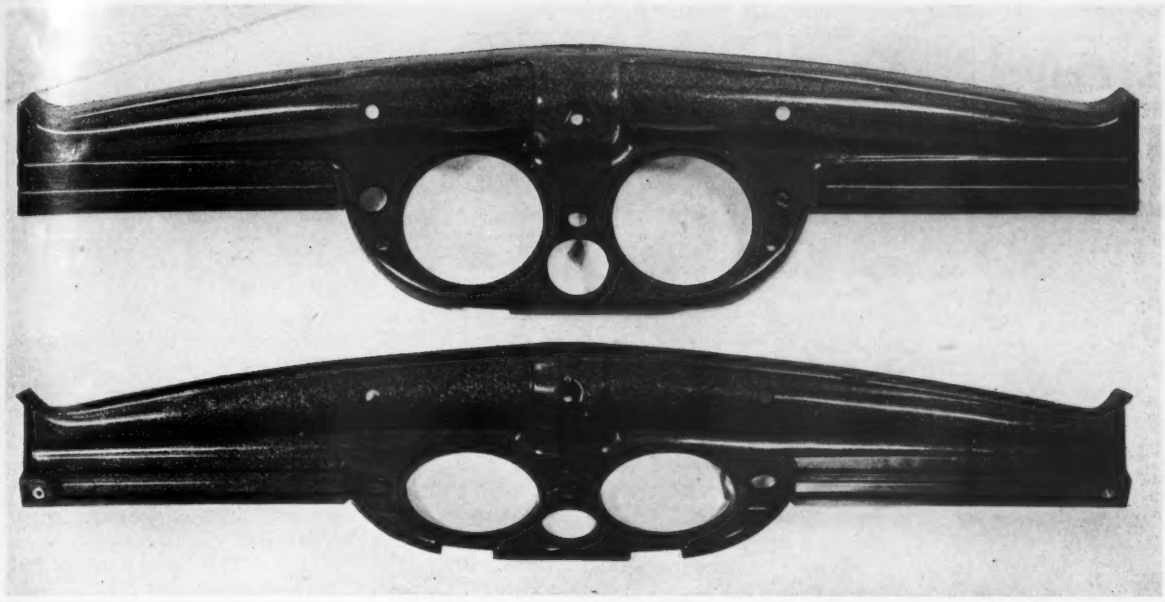
We stated that compared with American cars, and we gave the new Nash as a good example, British cars were generally devoid of plastics and on the whole a pretty dull affair inside, unrelieved by any enlightening splash. The Nash, on the other hand, possesses an instrument board moulded of a beige-coloured plastic that was a joy to behold and to touch, and one that contrasted so gaily with the rich brown colour scheme of the interior. Steering wheels, window winders, and gear-wheel knobs were moulded of material in the same light beige.

Now, although our efforts at urging British manufacturers to introduce a spot of light into a dark interior have not been entirely satisfied, yet one factory at least is contributing towards a brighter motoring life. We refer to Sunbeam Talbot, Ltd. Moreover, it has been the first to introduce plastic mouldings on a scale never before attempted, within our knowledge, in this country.

It is the first time, we believe, that an entire facia-board, as a unit of construction, has been fabricated and right well has the job been carried out. Moulded instrument boards have been made, it is true, but until now they have but formed the skin, so to speak, of a metal or wood backing which was the real unit of construction and was one with the remainder of the body. The new Sunbeam Talbot facia is now part of the car structure and is built into it. The moulding is not merely a surface adjunct. As a piece of moulding work it is noteworthy, as a glance at the photograph showing front and back will reveal. It is 3 ft. 3 ins. in length, weighs nearly 3½ lb. and is moulded in a special synthetic resin which Sunbeam Talbot call Cellustra. The moulding of these units was carried out by Thos. de la Rue, Ltd., who inform us that it is the longest, although not the heaviest, moulding they



Interior showing the new facia-board. It is 39 ins. long and weighs about 3½ lb.



Front and back of the new facia. It is probably the longest moulding made.

have carried out. In addition, all the window-frames are of the same material.

So much for the mouldings. But now let us praise the same company for a worthy attempt to introduce pleasing colours into the interior of the British car. Not that the new machine we describe here is a blaze of oriental colour inside. Far from it. But it is the first attempt within our knowledge to get away from the mournful black and, what is worse, the dull snuff-browns of past eras. May they pass for ever!

The Cellustra window-frames fitted into the doors.

Two colours have been selected for the facia-boards and the window-frames, and it is not easy to describe them, for they are so new. Thanks be, they make no attempt to imitate wood or stone. To the cognoscenti the material is plastics and nothing else could produce the same effect of colour and texture. One of the colours may be likened to a dark mahogany colour heightened here and there with flashes of green and crimson—warm, soothing and rich—a facia that cannot but help bring a glow of satisfaction to the most blasé and frigid of owners. The second colour, too, is new—a speckled grey delicately harmonizing with the general decorative scheme.

During our visit we had an interesting talk with Mr. Reeves, one of the engineers of the company. Apparently the problem of using plastics had long been considered and it was only after lengthy deliberation and analysis that the present forms and colours have been decided on. He stresses the point that plastics were not chosen for cheapness, although a saving, in fact, is effected. The Sunbeam Talbot is not what is generally called a mass-production job, since vast numbers are not made. One of the most important advantages of plastic mouldings is that they do not weather. The rapid weathering of wood and metal cheapens a car in more ways than one, for nothing looks shabbier than a car in which the paint or varnish has been stripped to show the wood or metal beneath.

There is, too, a growing realization that with plastics, design of manufacture is simplified, and that with the same mould a multiplicity of colours can be obtained at will and without delay. Another point that Mr. Reeves made was one that we have not previously heard discussed, since, presumably, experience has only just brought it to the fore. It is that the plastics facia-board excludes and deadens many sounds that emanate from certain moving parts. It is interesting to speculate that the future motorcar may possess a completely silent interior.

LAMINATED SHEET FOR ELECTRICAL PURPOSES

By E. E. HALLS

THE earliest synthetic resin of importance was the condensation product from phenol and formaldehyde and this group of plastics provides the base of the bulk of synthetic electrical insulating materials. Laminated products comprise sheets of paper, fabric or asbestos, impregnated or coated with the synthetic resin, built up into boards and bonded together into a durable, hard mass. Manufacture is somewhat complex, but briefly it may be considered as follows:—In the case of paper base laminated, paper from rolls is passed through a tank of varnish, the surplus varnish being removed by wiping rolls as the paper leaves the tank. The treated paper is then fed through a long steam-heated chamber in order to dry off solvent, temperature and rate of passage being carefully controlled to ensure adequate drying without undue polymerization of the resin at this stage. The tension on the paper and the evenness of feed are important for the avoidance of wrinkling and excessive stretch. Next the dried material is re-reeled ready for the cutting machine. The latter cuts the paper into sheet size and stacks it. Dependent upon the thickness of the board required, the requisite number of treated paper sheets are placed between polished steel sheets. A number of such stacks are then loaded between the steam-heated platens of a hydraulic press, pressure is applied, and the load exposed to controlled heat for a predetermined time period. This effects polymerization of the Bakelite resin, by which means it becomes hard, infusible and insoluble. The presses employed each have more than one light, in order to distribute both heat and pressure more uniformly throughout the load. At the end of the heating cycle the steam is cut off and cold water circulated through the platens to hasten cooling of the load. The press is unloaded, the steel sheets stripped off the insulating material, and the latter are then trimmed to size, either by guillotining for thin stock or by sawing for thicker boards. This process produces sheets or boards having surfaces of high gloss and excellent appearance.

Similar processes are employed for the production of fabric or asbestos laminated sheet.

It can be seen from the above brief sketch that several factors in its manufacture govern the quality of the board produced. The nature of the raw material employed is a strong determining feature. In the case of paper, type of fibre, thickness, density, absorptive qualities, degree of calendering are all reflected in the characteristics of the finished sheet. Similarly with fabric, twist and lay of the individual threads and weave of the cloth, as well as finish, are governing criteria. Again, with asbestos, the make-up of the cloth in all senses vitally influences the nature of the resultant product. The other raw material, the varnish, which is in effect a solvent solution of phenol/aldehyde synthetic resin, likewise offers a field for judicious selection; the actual type of resin employed, the solvents for carrying it, and the consistency of the solution all have their influence. With regard to processing, in the base material treating section, the degree of impregnation and the quantity of resin introduced, that is, the ratio of resin to base material, are fundamentals. The other deciding features in processing are those entailed in the bonding and polymerization treatments, and these comprise pressure, temperature and time.

It will thus be seen that in each of the three groups of laminated plastics a series of grades are possible. For instance, to cite examples of paper base material (which is the most important of the three groups), these range from high paper/low resin content products to low paper/high resin content types, while again any of these may range from hard and comparatively brittle to less hard and more compressible, according to the pressure and time of cure to which subjected in manufacture. Consequently, practice has dictated several well-defined grades suitable for electrical purposes,

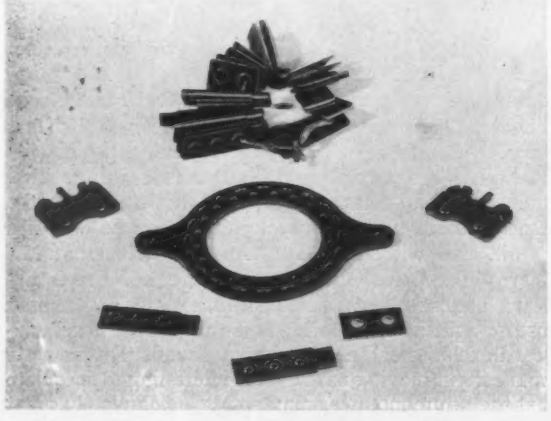


Fig. 1.—Components blanked from sheet.

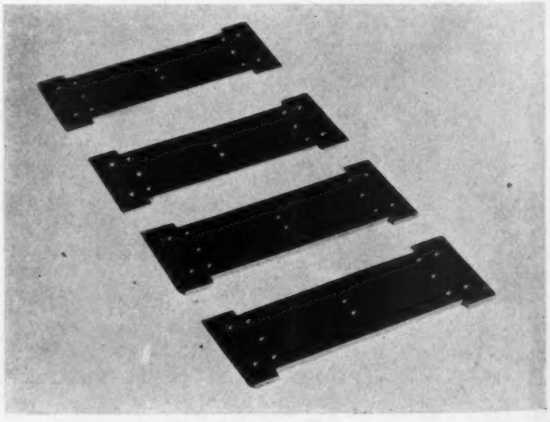


Fig. 2.—Asbestos laminated cores.

although the latitude within each grade may be quite wide.

In a broad way British Standard Specifications cover three grades of paper base boards. The B.S.I. adopted the descriptive term "synthetic resin bonded paper" sheets or board. B.S.S. No. 316 covers an ordinary good commercial grade of paper laminated for use in dry situations or under oil. B.S.S. No. 547 deals with a higher resin content material of relatively low moisture-absorbing propensities, subdividing it into two qualities in order to embrace a quality suitable for cold punching yet still retaining moisture-resisting characteristics. The requirements laid down in these specifications are not unduly stringent with respect to the qualities they purport to cover, and in practice rather superior grades can be secured if desired. The latter is largely a result of advances by the manufacturers subsequent to the preparation and ultimate issuance of the standard specifications concerned. However, before discussing systems of grading it may prove helpful to survey the manufacturing factors which largely determine selection.

The bulk of laminated plastics is used for the production of small components by established engineering processes of blanking, piercing and drilling. Particularly has it to be borne in mind that the articles are produced by inexpensive labour under mass conditions, and, therefore, although tools are maintained to a certain standard, trouble-free production largely depends upon the initial selection of correct grade of material, and thereafter maintenance of consistent quality. Consequently, fabrication largely governs the grade of material employed, and in low-voltage work, and for service conditions in dry situations, it becomes practically the only determining factor. The raw material is not a homogeneous sheet, but is of lamellar construction, the adhesion between the laminæ governing ability to withstand blanking, piercing and drilling. A hole produced by piercing or drilling is always smaller in diameter than the tool with which it is produced. Hence, on the extraction of the tool from the hole a drag occurs, which tends to lift up the surface laminæ. On the other hand, brittleness is not favourable to punching because it promotes a tendency to cracking and crumbling away from the cut edges. Two opposing factors thus exist. However, a considerable quantity of laminated sheet is used for panel work, on which the number of machining operations is small, and production is on the batch-type basis, so that considerations mentioned above do not apply with the same force.

Fig. No. 1 shows a number of small components blanked from sheet. The larger component very well illustrates the amenability of the low water-absorption punching quality paper base material for clean blanking and for piercing of small holes. The components from fine weave fabric laminated show its suitability for complex shapes with many piercings. The rectangular components from low water-absorption punching grade of paper laminated illustrate how, by means of a semi-piercing operation, a combined insulating separator and bush can be provided. Fig. No. 2 illustrates a popular application of asbestos laminated—a core upon which resistance wire can be directly wound for a unit operating hot.

With respect to the criteria set forth in the introductory article (May, 1938, page 166) the paper and fabric laminated are chemically inert, and no trouble from corrosive action towards metals with which they make contact is experienced. Further, its structure is such that no electrolytic action or loss of insulation is promoted by virtue of retained chemicals upon exposure in damp conditions. The asbestos products are markedly alkaline, but, nevertheless, do not give rise to corrosive action under normal conditions of service.

The influence of water depends upon the grade of material, but all are absorbent to a more or less degree. Paper base materials to B.S.S. No. 547, or superior, having low water-absorption values, do not suffer markedly under damp conditions with respect to lowering of insulation or dimensional changes. The ordinary grades of material that would satisfy B.S.S. No. 316 would show serious loss of insulation resistance, while dimensional changes under damp conditions would prove troublesome in certain circumstances. For this reason the ordinary grades are not recommended where electric strength characteristics are of importance, unless the components operate under oil or are varnished or otherwise suitably treated. The fabric base materials do not exhibit the same electric strength standard through their thickness as do the paper base materials, and consequently would not be employed where electrical characteristics are critical, unless under oil, so that lowering of insulation by moisture absorption has not the same significance as in the case of paper base materials. Again, the asbestos base boards would be selected for their better fire-resisting qualities, and would therefore only be employed for components operating hot.

When exposed to heat shrinkage occurs, but at the temperatures normally encountered in service dimensional changes are very small. On the other hand, when pressure in conjunction with heat is involved—for example, in spring set assemblies—initial expansion upon first exposure to heat produces plastic flow, so that upon recooling dimensions may change sufficiently to necessitate reclamping. All these changes are most marked with high water-absorption materials, and least

TABLE No. 1

	Ultimate Tensile Strength. Tons/Sq. in. (Method to B.S.S. 316 and 547)	Compressive Strength. (Method to B.S.S. 316 Yield %)
PAPER BASE		
Low Water Absorption Grade	4.0	1.25
Low Water Absorption Punching Grade	4.5	3.5
Ordinary Grade	7.5	1.5
FABRIC BASE		
Ordinary Grade	4.5	2.75
Close Weave Grade	4.5	3.25
ASBESTOS BASE	3.5	1.0

TABLE No. 2

Electrical Values (B.S.S. 317 and 547 determinations)

	Electric Strength VAC Mil. @ 90° C.	Breakdown Along Laminae @ 90° C. K.V.	Power Factor @ 800 Cycles %
PAPER BASE			
Low water Absorption Grade	400	60	2
Low Water Absorption Punching Grade	80	10	8
Ordinary Grade	100	14	8
FABRIC BASE			
Ordinary Grade	40	5	—
Close Weave Grade	40	5	—
ASBESTOS BASE	25	2.5	50

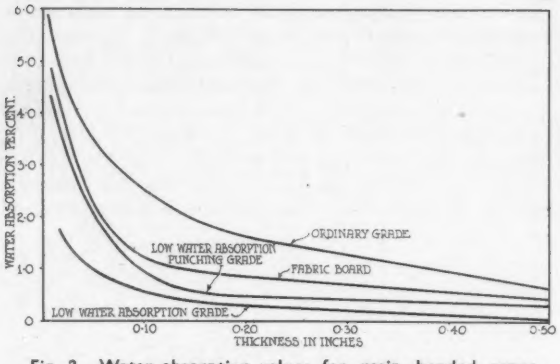


Fig. 3.—Water absorption values for resin bonded paper and fabric board.

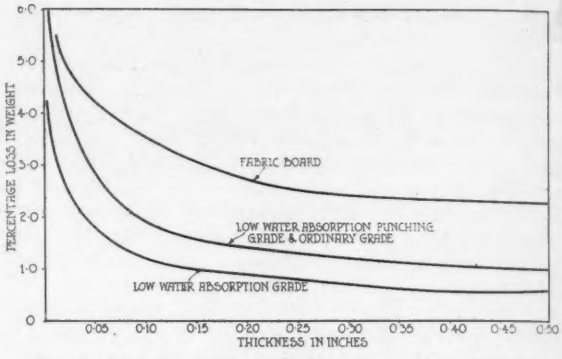


Fig. 4.—Loss on heating of the same; 1½-in. squares heated at 110° C. for 6 hours.

marked with low water-absorption grades, so that selection has to be made accordingly. In all grades, if prolonged exposure to heat occurs, embrittlement and some falling off in mechanical strength results. Under the usual conditions of heat encountered in service, no falling off in electrical characteristics will be exhibited. These remarks apply with equal force to paper, fabric and asbestos products.

Strength values are not high when compared on a size basis with those of the usual constructional metals, but are of high order when the nature of the materials is considered. Typical values are given in table No. 1.

The low water-absorption paper base materials (B.S.S. 547) are relatively excellent for drilling, and the high water-absorption materials (B.S.S. 316) relatively very poor. For blanking, the low water-absorbing materials perform well providing they can be blanked hot under closely controlled conditions of heating, while those to B.S.S. 316 blank cold satisfactorily. Thicknesses greater than 0.125 in. are not amenable to blanking operations. In piercing, holes must not be too close together or too near edges, otherwise checking of the surface or breakaway between holes occurs. The relative behaviour during piercing is similar to that in blanking. Milling and sawing operations are applied more satisfactorily to the low water-absorption materials. A note should be included here to the effect that although low water-absorption material responds better to drilling than the more highly absorbent grades, with closely spaced holes the result is not satisfactory where inserts have to be secured by riveting because of the crumbling tendency.

Laminated material is most readily evaluated by means of water-absorption tests. The latter have been standardized and are very simple, merely involving the preparation of a test piece 1½ ins. square, conditioning it in an atmosphere of 75 per cent. humidity at ordinary temperatures of 20 degrees C. ± 20 degrees C. for at least 18 hours. Water absorption is then measured by increase in weight upon complete immersion in distilled water at ordinary temperatures for 24 hours. Providing on initial selection electrical characteristics are checked to ensure that they are at least equal to the anticipated values, subsequently the water absorption can be made the chief criterion.

With the developments of recent years the limits in the standard specifications can be improved upon. It is considered that for paper base materials three grades satisfy practically all ordinary requirements.

The first of these grades should be an exceedingly low water-absorbing material. This will machine well, but may offer some difficulty in punching. It will serve for high electrical requirements, including cases where immersion in oil does not occur. It will also serve in high-frequency apparatus where design takes care of the natural limitations of the materials for this class of work.

The second grade is a similar class of material to the first, but having a slightly higher water absorption. This enables cold punching to be carried out, or punching under controlled heating. It also ensures retention of machining qualities and of good electrical properties under varying humidities.

The third grade is a good quality material but having a comparatively higher water absorption. This blanks, saws and mills well, but greater care is required in drilling. Electrically it is entirely satisfactory in application under oil or under dry conditions, such as represented by the majority of indoor electrical installations in temperate climates.

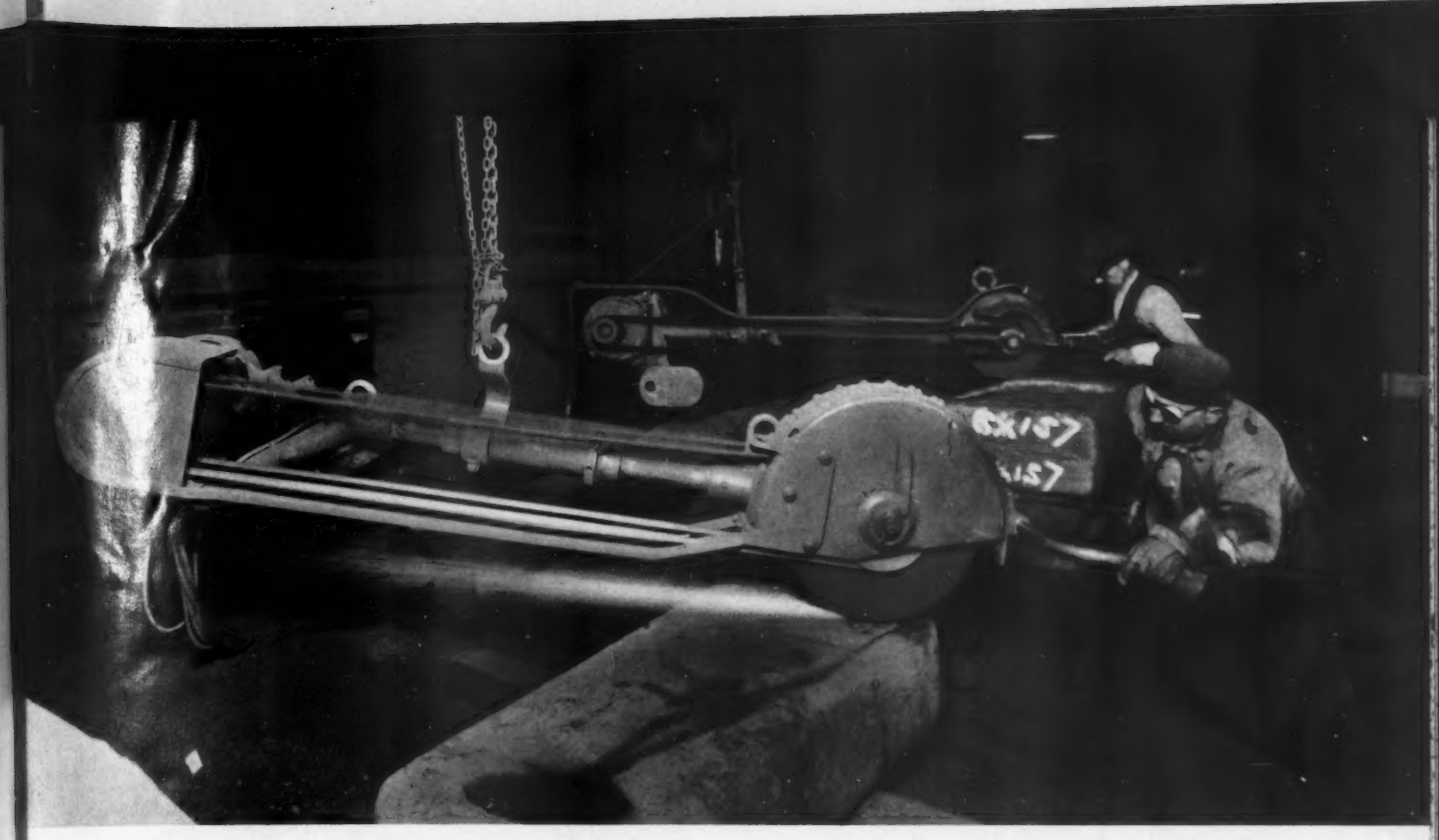
Coming to the fabric materials, these are resorted to on account of their superior bursting strengths. Two grades would seem to suffice for the majority of electrical applications. These two grades are distinguished by the count of the weft and warp. One of them should have a minimum of 75 threads in each direction, and this serves for the more severe blanking jobs where pierced holes are relatively close or close to edges, and for the more severe cases where cheeks have to be forced over knurled cores. The other grade, having fewer threads per inch, serves for the less severe cases and for larger components.

Regarding the asbestos base material, the mechanical tests are essential to specify in order to cover strength for all purposes, thus automatically covering the use of a suitable type of asbestos fabric and a suitable resin/asbestos ratio.

Besides water absorption, a desirable characteristic to specify is water already contained, and this can only be done by a total loss on heating test, the value obtained being moisture, together with other volatiles. Weight loss upon exposure to dry heat at 110 degrees C. for 6 hours is a suitable set of conditions.

The curves in Figs. No. 3 and 4 give the values for various thicknesses for water absorption and for loss on heating for the various grades of material discussed, Table No. 2 shows the important electrical values.

But the many problems which arise in connection with the methods of test commonly employed have not been dwelt upon, and it should be appreciated that to obtain concordant results from laboratory to laboratory close standardization is essential. Finally, it is asserted that plastic laminated is the most widely employed insulating material, this reflecting on its versatility, uniformity, range of grades available, high electrical and mechanical characteristics, and general utility.



Grinding steel billets with a Bakelite bonded grinding wheel.

HIGHER SPEED GRINDING—

NOW MADE POSSIBLE BY THE USE OF RESIN BONDED ABRASIVES

ABRASIVES and grinding wheels play a vital part in the production of thousands of different articles ranging from needles to the largest ocean liners. There are few industries that do not at some time or another require the service of an efficient grinding wheel. In the production of paper, modern pulpstones are used for reducing logs of wood to the essential fibres from which paper and even artificial silk are made. The smart and beautiful suède bags and shoes that are displayed in the West End shops all owe their origin to the buffing and fluffing wheels in tanneries which give the leather its fine, velvet-like nap.

Glass and ceramic goods come in contact with the grinding wheel to remove the rough edges of tumblers, mirrors, windscreens and all kinds of porcelain goods. Floor tiles and a hundred different grades of artificial stone and concrete all need cutting, forming and finishing off with abrasives and grinding wheels.

It is, however, in the engineering and allied industries that abrasives find their chief purpose. Without the precision-made grinding wheel, motorcars would be only for the select few, aeroplanes would be commercially impossible, and much of the complicated machinery so essential to mass production would be so expensive that our everyday needs would be luxuries.

In the early days of our civilization the crude metal weapons and tools were sharpened by patient and laborious rubbing with certain hard stones, and then, as man became more intelligent and discriminating, more efficient natural materials were found and even crude kinds of grindstones made. Progress was slow, but eventually the stage was reached where Nature's provision of rock and stone would not suffice. Then came a more careful selection of certain natural elements, with a graded sifting and a bonding together of the natural rock grits. Thus came the period of emery and corundum to meet man's needs for abrasives. Following these by slow and painful changes came the development of to-day's artificial or manufactured abrasives, made possible by the modern electric furnace.

Two of the most important abrasive materials in use to-day are aluminium oxide, also known as crystalline fused alumina, and obtained by fusing the mineral bauxite in the electric arc furnace, and silicon carbide made in the electric resistance type of furnace from coke and silica sand. The first-mentioned abrasive material is widely used for grinding high-tensile metal and alloy steels and carbide of silicon for many non-ferrous metals of comparatively low tensile strengths. It is no exaggeration to say that the large-scale production of these two synthetic abrasives really made possible the use of the grinding wheel as a production tool.

After careful grading of the abrasives, the hard and uniform grains have to be bonded or held together in some way so as to form wheels, segments, cylinders and other desired aggregates for grinding operations. The

bond is not an abrasive, but just a holder to support the abrasive grains while they grind and present to the metal or other surface thousands of little cutting teeth. It is the amount of bond that distinguishes "hard" wheels from "soft" wheels.

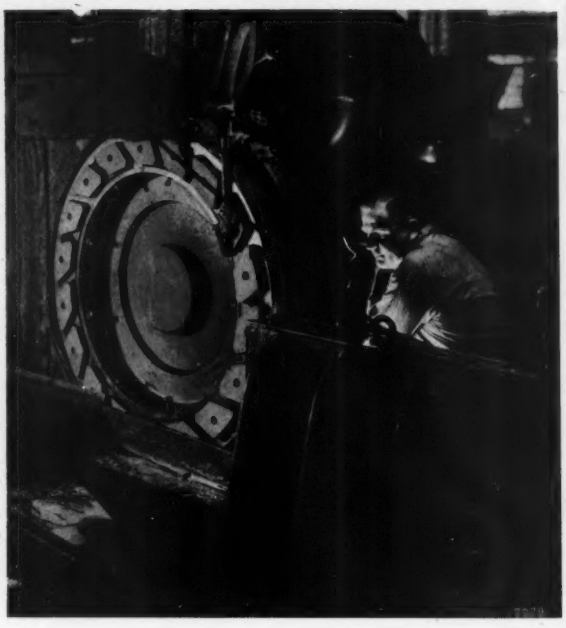
There are five different kinds of bonds. The first is the vitrified type which may be one of several varieties of clay. During the "burning" process in grinding wheel manufacture, a temperature is reached which is sufficiently high to fuse the clay into a molten glass condition. On cooling, a span of this glass connects each abrasive grain to its neighbour. Vitrified wheels are strong enough for very heavy work, but this speed is limited to about 6,500 surface ft. per minute.

Other bonds, such as silicate, rubber and shellac, all have their place in industry, but the bond which most concerns us at the moment and which to-day is considered of increasing importance in the engineering industry is the Bakelite bond. This was introduced in the United States about 15 years ago, and from the start gave great promise for high-speed work, especially as experience showed Bakelite wheels to have a cooler cutting action than the vitrified type.

Bakelite wheels find their chief use for high-speed grinding, mounted on floor stands and swing frame grinding machines for snagging (or cleaning) steel and grey iron castings and billets of steel or steel alloys. They are economical in use as they are able to remove the maximum amount of metal during grinding in the shortest time. Although they cost more than vitrified wheels, those bonded of Bakelite are accepted in modern industry as proved aids to increased production. Choice of grinding wheel is mainly determined by the cost it takes to remove a cubic inch of steel, and the Bakelite wheel can, under proper conditions of working, be highly competitive.

A large number of precision grinding wheels revolving up to 7,000 surface (peripheral) ft. per minute and also high precision cup wheels, cylinders and segments running at slow speeds, up to 5,500 surface ft. per minute, are bonded with Bakelite, which is very suitable for grinding large surfaces, as it is capable of removing a large amount of material in the minimum time. In the production of aeroplane and motor engine components, grinding with Bakelite wheels plays a vital part in a definite automatic programme.

Segments made by the Norton Grinding Wheel Company, Welwyn Garden City, mounted in the chuck for a Blanchard surface-grinding machine. The spaces between segments of this wheel provide clearance for worn-out abrasive to be washed away.



Norton segments in use on a horizontal spindle surface grinder. Bakelite bonded segments are now extensively used for surfacing steels and malleable iron. Segments have several advantages over solid wheels and the cost per set is usually less than that of a wheel of similar size.

It was the advent of the synthetic resin bond which really put the cut-off wheel on the industrial map and made possible the considerable increase of wheel speeds from 9,000 to 16,000 surface ft. per minute, which represents the difference between non-economical and economical speed for a number of materials. Bakelite cutting-off wheels are made up to 16 ins. by $\frac{1}{8}$ in., but they can be made 1-32nd inch in width and for special purposes such as cutting off tool tips from solid bars of cemented carbide, resinoid-bonded diamond cut-off wheels as thin as .03125 in. are employed.

Bakelite cutting-off wheels can be used for cutting off alloy-steel bars too hard for cutting off by any other means at a high rate. One-inch steel bars can be cut through in three seconds.

In considering the wide applications of grinding wheels it must be remembered that whilst chemical research has made possible the present bonded abrasives, the engineer is entitled to his share of the credit for perfecting machinery able to work within fine margins of accuracy. Thanks to the close co-operation of chemist and engineer, grinding has become an automatic and uniform process in many industries. In spite of the greatly increasing running speed of the wheels there are comparatively few accidents, as, before leaving the works, all wheels are speed tested at 50 per cent. higher than the maximum working speed.

A worker using a photomicrographic camera at the new I.C.I. laboratories at Manchester where valuable work is being done on Neoprene.

★

A new rubber cement which has just been patented by the Rubber Research Association does not shrink or crack after setting. It is made by adding caustic alkali to a mixture of latex and Portland or aluminous cement. Stabilizers such as casein, saponin or sodium silicate must be added, and, in addition, vulcanizing ingredients may also be present. The cement may be mixed with granite, marble chippings, asbestos or other suitable filling materials before addition to the latex.

★

According to the *Manchester Guardian*, August 5, 1938, considerable improvement has recently been made in the manufacture of elastic yarns. It has taken almost 10 years to bring these yarns to the present high degree of excellence. There are several inventions which have been patented covering the production of the yarns. One provides for a special mixture of ingredients to form a solution for the spinning of the elastic filaments, composed of solutions of rubber latex and viscose spinning dope intimately mixed. Others cover processes for spinning and winding rubber filaments. An improved form of construction has been devised involving the combination of one or more rubber filaments with one or more non-extensible threads of cotton or other fibrous material. A method has also been discovered for "fixing" the elastic threads under tension for the purpose of facilitating the operations of weaving, knitting and the like. Viscolax Yarn Distributors, of Manchester, is one of the largest firms in this particular line of business.

★

The prevalence of drawn matches during the past cricket season has encouraged some sports writers to put forward a plea to the M.C.C. regarding the claims of the all-rubber pitch. This, according to many distinguished judges of the game, would quickly brighten up the sport and make the duel between bowler and batsman of real live interest. True, it would help the fast bowler more than the googly merchant, but there is little doubt that the latter would quickly adapt himself to the changed conditions and evolve a new and probably more diabolical technique to trap the unwary batsman.

★

An interesting and important departure in the parking of commercial vehicles is shortly to be undertaken by the London Passenger Transport Board. At the Hornchurch garage, where £6,000 alterations have just been carried out, the buses will be parked in the open. In the cold weather the radiators of the vehicles will be connected by rubber tubing to steam pipes and steam will percolate slowly through the water in the radiator and so prevent it from freezing. It might be a good idea for commercial travellers in the habit of parking cars in side streets for several hours at a time to carry round a few hundred feet of rubber tubing, so that they can connect up with a convenient steam supply and keep the engine nicely warm and ready for a quick get-away!

★

The Neoprene bucket is now finding important industrial uses, especially in tanneries, laundries and the chemical trades where corrosive fluids and solids have to be handled. David Moseley and Sons, Ltd., of Chapel Field Works, Ardwick, Manchester, 12, are the manufacturers of the type illustrated, which is sturdily designed for gruelling service in various kinds of works. The chief advantages claimed for the Neoprene bucket are its comparative lightness, flexibility and strength due to its unique reinforced construction.

★

Steel helmets for civilian use in case of war will shortly be available at all hardware shops for a few shillings each. They will be made of $\frac{1}{16}$-in. armour-plate steel and have a pad of sponge rubber lining to ensure comfort during use. Head Protectors, Ltd., of Grimsby, are the manufacturers, and they are going into production on a big scale. It is predicted that there will be a considerable demand for these precautionary helmets, although the paucity of styles may be a deterrent to the smart set!

★

In a paper read to the Birmingham Paint, Varnish and Lacquer Club by Dr. Otto Jordan, he mentioned the excellent results now being obtained by the use of chlorinated rubber for special protective paints. In the case of iron, very satisfactory results can be obtained if the metal is free from rust, dry and also free from grease. When considering wood, it must be realized that chlorinated rubber does not penetrate as deeply into the pores of the wood as an oil paint, which has a low molecular weight. Thus the adhesion to wood is also less satisfactory. If, however, the wood is first treated with a 20 per cent. solution of an alkyd resin or a suitable solution of a drying oil and allowed to dry, the chlorinated rubber film binds very well on the primer, and wood painted in this manner will withstand even severe exposure.

When treating concrete with chlorinated rubber care must be taken to see that the former is really dry and does not contain more than 2 per cent. water. In order to use chlorinated rubber paints on damp concrete, a new special plasticizer, marketed as Plastomoll S.W., has been introduced, and, according to all reports, effects excellent adhesion of the paint to damp concrete.

★

Rubber plates have been extensively used for printing corrugated boards, cartons and similar packaging materials for some years now, but although rubber gives good service under ordinary conditions, it is liable to be

Neoprene printing block for the printer specializing in cartons, bags and wrappers.

adversely affected by printing inks containing oils or solvents. In order to overcome this disadvantage and give the block a much longer life, the British Tyre and Rubber Co., Ltd., have now introduced Neoprene blocks. These give an all-round better performance under the most difficult conditions of service, and they are rapidly being specified by customers anxious to obtain the best results on long runs. According to reliable reports these Neoprene blocks not only produce better class work but really save customers' money.

★

Recent work carried out by the Building Research Station on the insulation of buildings, particularly modern flats, shows that for floating floors special rubber cubes are amongst the most reliable materials under load. If protected from light, oils or greases, and other deteriorating elements, rubber has an approximate life from 20 years to 40 years. When rubber flooring material is laid direct on to wooden floorboards a maximum of probably 5 phons reduction takes place, but with sponge rubber, used in conjunction with under felts, as much as 10 phons reduction in noise is obtainable. The floating floor is, however, the most efficient method of insulating a building.

★

A new kind of glass product for electrical use has recently been introduced to the electrical industry and consists of a glass sponge filled with rubber. It is claimed to be a particularly strong and durable insulating material. Only sketchy details are so far available as the product is of American origin, but we understand that there are a few samples at present in this country which are engaging the attention of experts.

★

According to the *Hardware Journal*, August 19, 1938, a device consisting of a fairly large box-shaped casing containing a rubber material, the rounding of which protrudes from the box, has been introduced by Van Mouwerik and Bal, Zeist, Holland, to prevent the noise caused by slamming doors. According to the type of door, the device is fixed on the door post by wood or metal screws or on the door itself, this being done in such a manner that the rubber body of the device comes into contact with the post when the door is closed. The device can also be let into the door post. Noise caused by shutting the door or by rattling is thereby prevented, because the rubber body absorbs the impact when closing and yields elastically when the door is pulled to. On the other hand, doors which do not close tightly are firmly held. We wish this invention every success because our nerves are continually being shattered by the slamming of doors.

★

The latest bait in America is a transparent rubber worm filled with a paste which attracts the fish. The paste dissolves in about an hour, but all the angler need do to revive his bait is to pump a fresh supply of paste into cunning rubber worm carcases. A small filler is provided for this purpose. Instead of filling the rubber "worm" with bait why do not manufacturers make genuine-looking rubber bait which would tempt even the most wary fish?

★

There is a bridge on the Seine near St. Cloud, Paris, which has its roadway covered with rope to reduce the vibration caused by heavy traffic. This novel and apparently successful method has been improved on in America, where some interesting experiments have been carried out with rope roadways sprayed with latex. The rubber not only improves the resiliency of the surface, but also prevents the rope from fraying.

PRODUCTION

Practical Information dealing with Raw Materials, Moulding and Forming of all types of Plastics—Thermo-Hardening and Thermo-Plastic—Works-Organization, New Plant and Control Apparatus

NOTES AND COMMENTS

Sulphur as Moulding Material

SOME readers did not take Mr. Bryson's notes regarding sulphur as a moulding material quite seriously. This is probably due to the fact that his remarks are so often written in humorous form, but those who are not acquainted with the uses of sulphur other than as a wash for horticulture or as a singularly obnoxious insecticide and germicide, may find this element of considerable value. We have seen an elaborate inkstand moulded out of sulphur on Mr. Bryson's desk. It gives one to think, although we confess that it was not a thing of beauty, since the colour—a bluish green—was so unattractive. The colour of sulphur is strong yellow, so that the colouring of mouldings made from it are somewhat limited. Moreover, they are not as strong, of course, as resin mouldings. A serious drawback, too, is inflammability, so that one cannot visualize much of a market in domestic and similar fields.

Nevertheless, in view of the cheapness of this raw material (the price is as little as £6-£9 per ton) and in view of certain special properties, sulphur should find attractive uses in industry. We remember in another sphere producing moulded slabs of sulphur some 6 ins. square and 1-in. thick to line the inside of a large fume-cupboard in which nitric acid fumes were continually present during the production of a metal nitrate. Sulphur is extraordinarily resistant to nitric acid fumes, while the cost of making the slabs is negligible.

We remember, also, producing an interesting cold moulding material by dissolving sulphur in molten asphalt, the mixture resulting in a product possessing interesting characteristics. There must be several instances where such a cheap filler would enhance the properties of containers used for holding chemicals. We feel research in this direction would be worth while.

That some countries are very much alive to the possibilities of sulphur is shown in a recent issue of *The Manchester Guardian*. Some experiments by the Texas Gulf Sulphur Co., which, incidentally, is fortunate in being able to pump perfectly pure sulphur out of its mines, show that acid-proof pipes can be produced with its aid. Molten sulphur enters a rotating mould and forms a layer on solidification of about ¼ in. thick. Pipes of sulphur and cement, of asbestos and sulphur, and of sulphur, asbestos and gravel appear promising. As an example of its use the following may be cited. An 8-in. sulphur-lined steel pipe was placed in service in the discharge line of a brine well in 1934. Normally, the salt brine caused an ordinary steel pipe to fail in four months. The sulphur-lined pipe, after three and a half years' service, is still in good condition.

Casein Developments

IT has been declared that there are two drawbacks to casein for more extensive use. The first is cost, although we have long thought that this was low enough, which prevents its use for certain classes of buttons and other objects where much cheaper raw materials are employed. The second drawback is that casein can be moulded in the high-pressure moulding press only with difficulty.

Modern Plastics, the American journal, devotes some space to a new discovery whereby casein is not only cheapened, but also rendered mouldable. The new process which has now been patented under U.S.P. 2115316, has been developed by W. S. Murray, a chemist, who is also chairman of the Republican State Committee, and whose chief activities deal with waste products of industry. Amongst these, the milk industry, with its waste of skimmed milk, occupied his attention and naturally his thoughts turned to the casein industry, in which he claims the forming and formaldehyde-hardening process keeps the cost high.

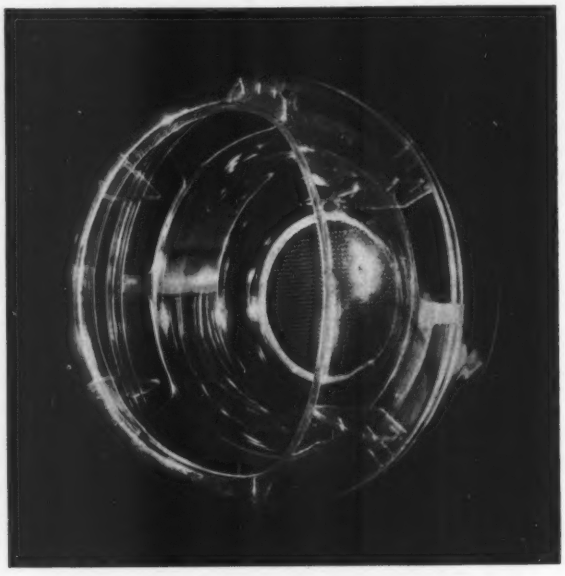
His new idea is to change the natural sugar in milk into aldehyde by chemical reaction. This, in turn, would act on the casein itself and convert it into hard material without the necessity of a subsequent hardening process. Mr. Murray's experiments, after considerable exploration, have apparently proved successful, and he obtained a powder that was stable after pressing.

The process is comparatively simple, the main reaction vessels for the production of the powder being a digesting plant and dryer. All the elements, including wood-flour or other filler, are put in the digester, where they are treated while stirring for a comparatively short period. When dried in an ordinary rotary drier, the product is removed in the form of a powder capable of being moulded in a hydraulic press. The product when moulded appears much like phenol-formaldehyde resins, dark colours only having been produced.

Mr. Murray believes that the plastic is suitable for making reasonably heavy pieces, such as cases, cabinets, etc., where other plastics would be too costly.

Cellulose Acetate Development

It may seem at first sight a far cry from spectacles to aeroplane windscreens, but a knowledge of the technique of forming cellulose acetate rims gives ample scope for developing into other industries. Some nine months ago Albert Optical Co., Ltd., of 124, Albert Street, London, N.W.1, decided to extend its activities and to take advantage more especially of the great development now taking place in the aircraft industry. To-day the company is working at high pressure completing orders for many aircraft concerns in the shape of windscreens, gun-turret windows, light covers, etc. Such work is, however, apart from the extreme accuracy needed in forming the shapes, not as spectacular as some of the work carried out by this concern. We have received in this office an example of what is probably the most complicated piece in transparent plastics we have yet seen.



Transparent plastic hair drier fabricated from Cellastoid by Albert Optical Co., Ltd.

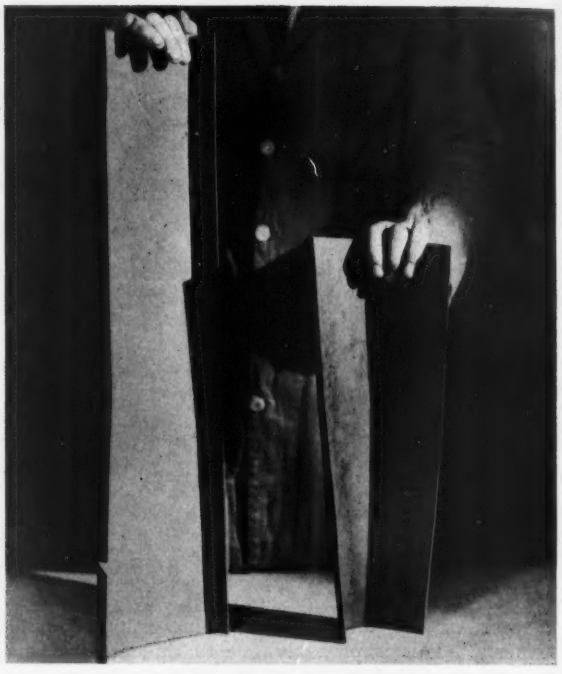
The photograph shows a very novel hair-drier fabricated by Albert Optical Co., Ltd., for use in permanent waving. It is made from Cellastoid, the cellulose acetate, to the order of C. Nestlé and Co., Ltd., the famous hairdressers of South Molton Street, London, W.1, who hold the patent rights for the design.

C. Nestlé and Co., Ltd., claim that the apparatus shaped from acetate is much stronger and less liable to breakage than when moulded from moulding powders. It also possesses obvious advantages in that it affords full visibility during drying to the operator, so that progress made can be gauged without removal of the drier from the customer's head. It is also claimed that with transparency there is no "boxed-in" feeling.

The new appliance will be released to the trade on September 20, when it will be exhibited at the Hairdressers' Exhibition.

Shaped Laminated Plastics

Many applications in the engineering industry present themselves for a new type of laminated sheet now marketed by Bakelite, Ltd. This possesses similar characteristics to existing grades of Bakelite laminated in its resistance to chemicals and moisture, its light weight and its good mechanical and electrical properties. It has become available already shaped to a variety of simple sections,



The new shaped laminated plastics manufactured by Bakelite, Ltd.

which greatly facilitates assembly operations in aircraft and general engineering construction.

A typical application covers the treatment of the leading edge of aeroplane wings, for which purpose the convenience of a shaped section of the type illustrated will readily be appreciated. One use of the material in aircraft is for covering aerofoil components which are subject to movement, such as the ailerons and tail plane, where its advantages are adequate strength coupled with a weight less than half that of aluminium.

In general engineering practice the shaped material has many potential applications, while it can also be employed for such diverse purposes as artificial arms and legs, leg-shields on motorcycles, mudguards on cycles, saw-guards, sheaths, etc. It is, in fact, suitable for all purposes where a light but strong construction is necessary, and which is required to withstand difficult conditions of service.

The material is available in corrugated form or shaped to simple channel and other sections.

The Chemists' Exhibition

This famous exhibition will be opened from September 19 to 23 at the Royal Albert Hall, Kensington, London, S.W.7. Although mainly devoted to pharmaceutical chemicals and drugs, there is always a large section of considerable interest to the plastics industry, since the pharmaceutical industry is noteworthy as being one of its largest customers for such materials as stoppers, container lids, cases and so on. It is usual to find stands of some of the more important manufacturers who specialize in the manufacture of moulded resin stoppers and screw-on lids.

In addition, there are also always exhibited a goodly range of filling and labelling machines, which are essential to some sections of the plastics industry.

Finally, there are the machinery sections, the most important stand of which is that of William Gardner and Sons (Gloucester), Ltd. This well-known concern are the makers of the famous "Rapid" (mixes an ounce with a hundredweight or more) sifters and mixers, and other machinery for the plastics industry.

Inquiries and Answers

Transparent Plastics

Luton, Beds.

The Editor, *Plastics*.

Dear Sir,—I should be much obliged if you could tell me whether there is available a perfectly transparent plastic material. If so, would you be good enough to let me know where I can obtain information about it?

FOR COMMER CARS, LTD.
Works Manager.

[EDITOR'S NOTE.—We presume the reader wishes for something more transparent than celluloid or cellulose acetate. The most transparent is Perspex, the Imperial Chemical Industries' product which is even more transparent than glass. This is available in sheet and moulding-powder form. Other transparent materials which are not so highly clear are Beetle transparent amino moulding powder and "styrol" resin.]

Acetate Sun-Blinds

Burnley.

The Editor, *Plastics*.

Dear Sir,—In your article "Paris-Monte Carlo-Rome," p. 262 of the August issue, there is a photograph of a shop fitted with an "acetate" sunblind. Is it possible to obtain further information on this type, and are they used with success in England?

F.H.R.

[EDITOR'S NOTE.—We do not know whether these blinds are in actual use here, but they are marketed in this country by May and Baker, Ltd., 42-43, St. Paul's Churchyard, London, E.C. Full particulars and prices can be obtained from this concern.]

Fireplace Kerbs

Birmingham.

The Editor, *Plastics*.

Dear Sir,—We have been advised by the *Daily Express* to write to you regarding the following:—

We are manufacturers of cheap extending bedroom kerbs which consist of wood ($\frac{3}{4}$ in. by 3 ins.) covered with metal back and front. For some time we have been trying to find a cheap composition which we can spray with enamel as a substitute for the wood. We have experimented with plaster of paris, cement and similar materials, but plaster of paris is too brittle and cement chips easily and is too heavy.

We want something very strong, which will dry without stoving, and as light as possible.

We shall be pleased if you can help us in any way.

R.P.

[EDITOR'S NOTE.—We fear "R.P." is asking what is at present impossible, at least, within our knowledge. The strength of plaster of paris and many similar materials can be increased by the inclusion of resin, but nearly all resins on the market must be stoved to get the maximum hardness. The ideal resin which will harden merely by exposure to air is not yet a fait-accompli. Haveg, the resin sold in this country by Kestner Evaporator and Engineering Co., 5, Grosvenor Gardens, S.W.1, is, however, a self-hardening resin, but hardens by chemical reaction, a fact which may interfere with the particular process, especially from the point of view of colour. The concern mentioned might be approached with the problem. "R.P." probably knows already that fireplace kerbs moulded entirely of synthetic resin have been manufactured for some time past.]

Window Display

West Kensington, W.14.

The Editor, *Plastics*.

Dear Sir,—The publicity section of this department supplies several thousand sets of window display material per annum, involving the use of numerous mechanical models and illuminated signs. Much trouble has been experienced through breakage of glass, and it has occurred to me, after perusing a recent number of your periodical, that it might be possible to use cellulose acetate or some other plastic material instead. The quantities of each plate would probably not exceed 50, and it may be that the cost of moulds, etc., would make the price prohibitive; but if you think the matter worth pursuing I shall be glad if you will put me in touch with the firms most likely to be interested in our problem.

For CONTROLLER,
Post Office Savings Bank.

[EDITOR'S NOTE.—Since only 50 or so of each object are required and transparency is desired, the job is one for the thermo-plastic sheet, such as cellulose acetate or "acrylic" resin. Plates of any size can be readily cut from the sheet, and since no mould is employed the cost is, for small numbers, comparatively low. If fairly thick plates can be used, another suggestion is the employment of cast resins, when a number of plates can be obtained by the slicing of a cast block of predetermined shape.]

Resin-making Plant

New Delhi.

The Editor, *Plastics*.

Dear Sir,—I should be much obliged if you would kindly give me the names of two or three manufacturers of small-scale plant and equipment for the production of phenol-formaldehyde moulding powders. Information is particularly required regarding firms who specialize and have had experience in the following branches:—

(a) Plant and accessories for the production of phenol-formaldehyde resin from the raw materials.

(b) Plant and equipment for grinding and sifting.

At this stage large plants are not required; a suitable size would be about 250 lb. per batch.

DIRECTOR OF INDUSTRIAL RESEARCH BUREAU.

[EDITOR'S NOTE.—Firms specializing in resin plant of this type are:—

Aluminium Plant and Vessel Co., Ltd., Northfield House, Wandsworth Park, London, S.W.18.
W. J. Fraser and Co., Ltd., Dagenham, Essex.

Concerns that build plant and equipment for sifting and grinding are:—

David Bridge and Co., Ltd., Aldwych House, London, W.C.2.
W. Gardner and Sons (Gloucester), Ltd., Bristol Road, Gloucester.
Steele and Cowlishaw, Cooper Street, Hanley, Stoke-on-Trent.]

TRADE AND PERSONAL NOTES

The Minister of Labour announces his intention of establishing a Trade Board covering the whole of the rubber manufacturing industry.

The Board, which will consist of representatives of employers and workers and three independent members, will fix minimum wage rates for all factories solely concerned with the manufacture of rubber materials, but will not affect waterproof clothing. Under the Holidays with Pay Act the Board may also make provision for a week's paid holiday a year.

The Department of Overseas Trade informs us that exporters should note that sterling payments through Sub-account "D" were made to United Kingdom creditors on August 6, 1938, in respect of deposits effected by the Italian debtors on April 23, 1938: that is to say, the transfer delay in respect of Account "D" payments amounts now to 15 weeks. Account "D" is the account for deposits by Italian debtors in respect of exports of United Kingdom goods other than coal.

In these circumstances, exporters are advised to take careful note of the figures, showing the position of the clearing accounts, usually published in the "Board of Trade Journal" on the first Thursday of each month, and to exercise caution in connection with Italian business until such time as the clearing position may improve.

Resistoflex Corp., New York, U.S.A., are now manufacturing a flexible synthetic resin under the name of Resistoflex. This material, made from polyvinyl alcohol as a base, is said to be very tough, resistant to pressure, elastic and a good absorber of vibration. It is to be made in the form of sheets, gaskets, washers and tubes.

"Industrial Chemical Calculations" is a new book for the chemical engineer and works manager which should prove of considerable interest and value to our readers. It is published by Davis Bros. (C.T.J.), Ltd., 265, Strand, London, at 22s. 6d. net. The authors of this second edition, C. A. Hougen and K. M. Watson, deal fully and yet simply with all phases of their difficult and yet important subject.

Wrightson and Co., Ltd., of Thornaby-on-Tees, have opened a branch office at Birmingham, Central House, 75, New Street. Telephone No.: Midland 5642. Mr. L. T. Mogridge has been appointed manager.

Universal Metal Products, Ltd., are now in occupation of their new factory and offices at Langley Road, Pendleton, Salford, Lancs. The new telephone number of the company is Pendleton 1631-33.

Cascelloid, Ltd., Leicester, have bought 3½ acres of land for extensions to their present Coalville factory. The firm has now signed the contract for the first of these extensions, and work has already started on the building of a new factory covering half an acre. This will be completed by the end of the year in time for use for next year's trade.

Bushboard Co., Ltd., Team Valley Estate, is now manufacturing a laminated board surfaced with Bakelite. Three grades are available and maximum sheet size is 8 ft. by 5 ft.

Mr. H. H. Lusty, of Bakelite, Ltd., gave an interesting talk to the Haywards Heath Rotary Club on August 4, and described the many new applications of Bakelite.

"The Sisal Review," August issue, published by the Sisal Publication, Ltd., 18-19, Great St. Helens, E.C.3, contains a most interesting article by Dr. V. E. Yarsley dealing with "The Role of Fibres in the Manufacture of Plastics." Referring to the use of sisal in the manufacture of plastics, he says that, while sisal offers distinct advantages as a reinforcing material, it has the disadvantage of a rather high water absorption, and, since the fibre is rather coarse, it is somewhat difficult to mask in the finished moulded plastic. These difficulties, continues Dr. Yarsley, are not necessarily insuperable, and the advantageous physical properties of sisal are sufficient justification for continued effort in this direction.

General Plastics, Inc., U.S.A., has issued a four-page supplement to their recently published booklet on "Molded Durez for Table Radio and Cabinets," which includes new radio cabinet assemblies and plastic parts.

Carbide and Carbon Chemicals Corp., U.S.A., announce the ninth edition of their excellent brochure dealing with synthetic organic chemicals.

Izmir (Smyrna) International Fair, which is held from August 20 to September 20, 1938, houses a United Kingdom building organized by the Department of Overseas Trade.

The London Shellac Research Bureau inform us that the first report on the Baisakhi lac crop for 1938 is estimated at 915,000 maunds (1 maund = 82 lb.). The revised estimate reduced this to 862,000 and the present General Final Report again reduced the figure to 814,500 maunds. This compares with a yield of 798,000 maunds in 1937 and 760,000 maunds in 1936. The crop is, therefore a large one, but owing to the rainless weather experienced in the spring and early summer, the encrustation of the lac was not up to the mark and generally the crop is reported as being slightly below the average.

The Department of Overseas Trade draw our attention to the facilities which the Trade Commissioner Service can afford to representatives of United Kingdom firms visiting India.

The Department will be pleased to provide representatives of firms contemplating such a visit with letters of introduction to the Trade Commissioners in question.

In addition, an officer of the Indian Section of the Department in London will be pleased to discuss with representatives the proposed tour with a view to rendering assistance not only as regards market conditions obtaining in India at the present time, but also, if desired, in respect of itinerary, clothing, equipment, etc.

The Exact Weight Scales Company's new industrial scale known as the Shadowgraph is being increasingly used in industry because it enables analytical precision to be obtained under high-speed production methods. So far this machine has not found any serious application in the plastic industry, but there is little doubt that it would prove of considerable practical importance, especially for really accurate work such as the moulding of optical lenses.

Mouldcrafts, Ltd., 292, High Holborn, and Kent Road, Dartford, is now in compulsory liquidation and in the hands of the Official Receiver. The statutory first meeting of creditors and shareholders was held on Tuesday, August 9, at the Board of Trade Offices, Carey Street, W.C.

Mr. J. Barwick Thompson, Senior Official Receiver, reported that the story he had to present was a singularly unattractive one from the point of view of the unsecured creditors, because, according to his present information, it was very doubtful whether any dividend could be paid to those creditors. The order to wind up the company was made on July 4 upon the petition of judgment creditors for £281.

The statement of affairs lodged under the liquidation showed the position at the date of the Receiver's appointment on June 13 last, and the figures were subject to certain reservations. It showed total liabilities £24,202, made up of 99 unsecured creditors for £18,615; liabilities on bills, £50; preferential claims, £312; and loans on debentures, £5,224. The assets were valued at £3,483, and would be entirely absorbed in the preferential and debenture claims; total deficiency to shareholders £24,669.

NEW MATERIALS—NEW PLANT—NEW METHODS

New Plasticizer for Ethyl Cellulose Plastics

The Hercules Powder Co., Incorp., of Wilmington, Delaware, U.S.A., have sent us a most interesting booklet entitled "Hercules Chemist." A good deal of important information is given about the company's new plasticizer known as Hercolyn. This is hydrogenated methyl abietate and is derived from natural resin acids by a chemical process that involves high temperature, high-pressure esterification followed by catalytic hydrogenation. The resultant product is a viscous, non-volatile, water-insoluble liquid, pale amber in colour, neutral in character and resistant to saponification by alkalis and weak acids.

Hercolyn can be rolled or milled with ethyl cellulose in fairly large proportions for the production of tough, flexible compositions suitable for extrusion moulding. For example, a composition containing as much as equal parts by weight of Hercolyn and ethyl cellulose is tough and free of tackiness.

RHODOLENE M

Rhodolene M is a polystyrol resin prepared in a form especially suitable for injection moulding and marketed in this country by May and Baker, Ltd. It is very suitable as an injection moulding material for the following reasons:—

1. It flows very freely at injection temperature, permitting accurate reproductions of the minutest detail in the mould and realization of very thin sections.

2. It leaves the polished mould surfaces very easily when cooled below 40 degrees C.

Articles moulded from Rhodolene present the following characteristics:—

Brilliant appearance and perfect finish straight from the mould.

Clarity, superior to glass, even in very thick sections, and refractive properties giving great brilliance and éclat.

Water absorption absolutely nil.

Specific gravity 1.05 lower than that of any other material ordinarily employed for moulding.

An outstanding feature of Rhodolene is its excellence as an insulator, which, with its total lack of water absorption, low dielectric constant and low hysteresis loss make it unrivalled for electrical applications.

Rhodolene can be made in any transparent and translucent colour, and matching or production of special colours can be undertaken on request.

Chemical Properties

Resists the action of strong and weak acids and alkalis, minerals and vegetable oils and alcohols.

Solvents

Rhodolene is soluble in ketones, esters, chlorinated hydrocarbons, benzene and its homologues, turpentine, ether. Solvents, for example, benzene, may be used for welding together moulded sections of Rhodolene.

The Injection Moulding of Rhodolene

Temperature of Material

The temperature at which Rhodolene becomes sufficiently plastic for injection is 142-145 degrees C., but in normal working, higher temperatures than this are used to ensure complete filling of the mould and production of mouldings of desirable quality.

When injecting into a cold mould, the optimum temperature will depend on the distance which the material must travel before the mould is completely filled, and on the cadence of injection. These depend in turn on the form of the article, the way the mould is designed and on the design of the injection machine used.

As an indication, 170 degrees C. may be mentioned as a normal working temperature, although, where special circumstances make it desirable, the material can be worked at temperatures up to 210 degrees C. The temperatures indicated apply to the material as it is about to leave the heating cylinder, i.e., in the nozzle.

Temperature of Mould

The mould should be cooled to ensure rapid ejection and prevent adhesion, which is liable to occur if the temperature is above 40 degrees C.

Pressure

The pressure necessary is 3-9 tons/sq. in. The optimum pressure depends on the form and section of the article. Pressure should be maintained while the material is cooling or solidifying in the mould. For articles of thin section, pressure may be taken off and the mould opened almost immediately. Under all circumstances the piston should advance rapidly

Control

For good production and consistent results, it is essential to control the temperature of the material at the moment of injection as well as the pressure exerted on the material.

It is as well to request injection-machine manufacturers to provide a means for inserting a thermometer as near the nozzle of the heating cylinder as possible. If this is impossible the temperature of the nozzle can be checked by using melting compounds which fuse at definite temperatures.

Rhodolene M can be used for electrical components, formers, etc., where superlative insulation and low dielectric loss at high frequency are required, also for all kinds of fancy goods.

Heavy-duty Thermostats.

These are designed and made by The British Thermostat Co., Ltd., Sunbury-on-Thames, Middlesex, for controlling industrial heating processes operating at temperatures up to 400 degrees F. The best known and most important application of these instruments in the plastics industry is for the heater platens of moulding presses.

The temperature-sensitive element is a phial charged with a volatile liquid, and is connected by an armoured capillary tube to a flexible metallic bellows which operates the switch mechanism. Changes of temperature at the phial results in a corresponding change of vapour pressure in the charged system, causing the bellows to expand on a rise of temperature or to contract on a fall of temperature. Movement of the

bellows operates the switch against spring pressure, which can be adjusted in order to pre-set the control temperature.

The movement is robustly constructed and is enclosed in a substantial dust and moisture proof die-cast metal case. The temperature setting can be adjusted by the knob at the side and provision is also made for varying the differential.

The terminal box has a separate removable cover and two entries tapped ¾ in. E.T. and fitted with ebonite bushes.

PATENTS RELATING TO PLASTICS

These abridgments of recently published specifications are specially compiled for this journal by permission of the Controller of His Majesty's Stationery Office. Group abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, either sheet by sheet, as issued, on payment of 5s. per group volume, or in bound volumes, price 2s. each, and the full specifications can be obtained from the same address, price 1s. each.

485,200. Laminated Sheet Materials; Packages

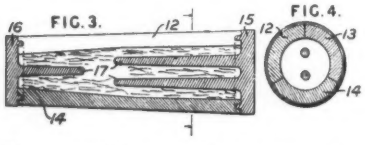
SHELLMAR PRODUCTS CO. Nov. 17, 1936, No. 31,474.

Laminated wrapping material for packages comprises a sheet of transparent cellulosic material, e.g., regenerated cellulose or cellulose acetate, having a moisture-proof coating on one surface, and a sheet of paper coated with paraffin wax. The two sheets are bonded together on their uncoated surfaces, e.g., by means of an adhesive, e.g., a lacquer. In forming a package, the laminated material is folded with the edges overlapping in such a way that the wax coating on the paper is superimposed on the moisture-proof coating of the cellulosic sheet, and the overlapping portions are bonded together by heat and pressure.

484,673. Moulding Artificial Sponges, etc.

TAYLOR, W. I., and GIBBINS, L. B. November 6, 1936.

Artificial sponges, loofahs or other articles made of saponifiable material are moulded in a mould, the surfaces of which are dressed with an alkaline dressing. The sponges may be made of regenerated cellulose acetate as described in Specification 402,055.



The moulding surface may be roughened, as by sand-blasting. As shown in Figs. 3 and 4, a mould for moulding loofahs comprises ends 15, 16 having projections 17, and adapted to interlock with similar side portions 12, 13, 14.

486,127. Vinyl Polymerization Products; Resinic Acid Derivatives

JOHNSON, G. W. (I. G. Farbenindustrie Akt.-Ges.). December 16, 1936.

Vinyl ethers of abietinol or hydroabietinol are polymerized in the presence of acid-reacting condensing agents at 150 to 250 degrees C. Boron fluoride or its addition products with ethers, alcohols, acids or water may be used as the condensing agent. The polymers may be mixed with drying oils such as linseed oil, wood oil and their stand oils, or with oil-modified alkyl resins, and used as lacquers. In an example, a solution of boron fluoride dihydrate in dioxane is added at 215 degrees C. to dihydroxyabietinol vinyl ether. Alternatively, gaseous boron fluoride diluted with nitrogen may be employed. The product is soluble in benzene, toluene, solvent naphtha, cyclohexane, ligroin, lacquer benzine, carbon tetrachloride and cyclohexanol acetate, and insoluble in methanol, ethanol, dimethyl and diethyl ether, and acetone. The starting material may consist of a mixture of abietinol and hydroabietinol vinyl ethers obtained by catalytic hydrogenation of crude colophony and subsequent treatment of the product with acetylene.

484,929. Perforating Indiarubber

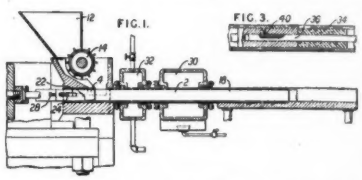
JONES, F. C., and LUMSDEN, E. November 18, 1936.

Indiarubber sheet is simultaneously perforated and patterned by means of dies or drums, one carrying pins and the other having corresponding recesses, one or both having a relief pattern thereon. The surface of the matrix roll may be of vulcanized rubber, the recesses being formed on running the apparatus while the rubber compound is still soft. The rolls may be heated to effect partial or complete vulcanization of the sheet, or this may be carried out as a separate operation. Specification 457,203 is referred to.

484,544. Extruding Plastic Substances

ARMSTRONG CORK CO. July 21, 1937.

In extrusion apparatus for material such as comminuted cork and a binder, a part of the elongated extrusion passage is moved at the same speed as the material during part of its movement so as to reduce friction. The material is forced by a plunger 4 through a passage 2 of rectangular cross-section, the upper and lower surfaces of which are fixed, while the side walls 18 are movable and extend beyond the top wall. The walls 18 are connected to the plunger 4 by a lost motion device comprising projections 24 on the plunger engaging in slots 22 in the walls. The amount of lost motion may be varied by adjusting screws 28. The material is supplied from a hopper 12 by a distributor 14 and is first compressed by the plunger 4 and then advanced together with the walls 18. The binder may be hardened by a steam jacket 30 and the hopper end is kept cool by a cooling jacket 32. In



forming tubes, the outer passage 34, Fig. 3, may be fixed and the core 36 connected to the plunger by a pin-and-slot connection 40. Specification 201,623 [*Class* 87 (ii)] is referred to

485,805. Casein

SCHUELLER, E. April 16, 1937.

Concentrated solutions of casein having an acid reaction are produced by treating the casein with a weak solution of about 1-2500th of the amount of alkali that would convert the casein into caseinate. In an example, casein is moistened with a solution of caustic soda containing 0.1 part per 10,000, and the resulting mass is malaxated and suspended in water; it then dissolves to a solution of *p*H5.

484,828. Rubber Compositions.

PORRITT, B. D., SCOTT, J. R., and HOCK, A. L. January 7, 1937.

Compositions for the production of ebonite or hard rubber for electrical purposes have incorporated therein kieselguhr, infusorial earth, diatomaceous earth, fossil flour or Tripoli which have been treated to remove electrically detrimental impurities. The treatment may comprise washing with acid, e.g., hydrochloric acid and/or calcining preferably at 550-600 degrees C. A kieselguhr of fine particle size is preferred.

486,146. Synthetic Resins

KRAUS, M., February 11, 1937. February 11, 1936.

Horn powder, for example, that obtained by grinding hoofs, is treated with solutions of urea or thiourea and formaldehyde, or the initial condensation product of these substances, and dried, ground and hardened by drying at temperatures below 70 degrees C. Paraformaldehyde may replace the formaldehyde, and the treatment may be carried out in the presence of ammonia or hexamethylene tetramine.

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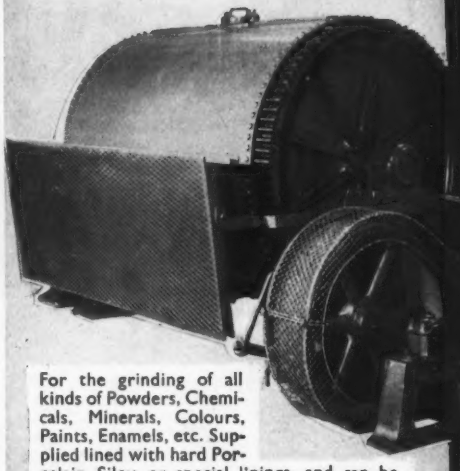

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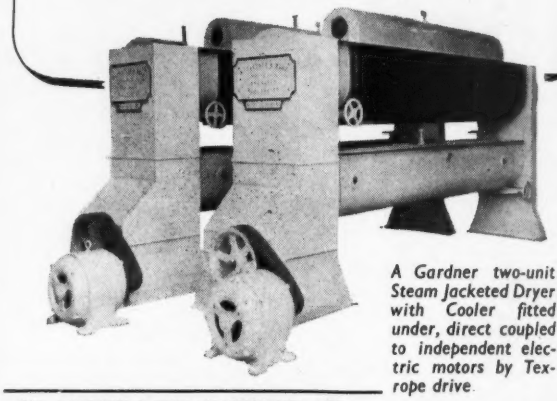

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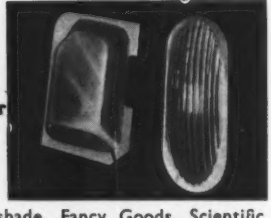

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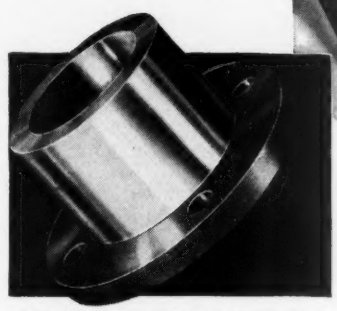

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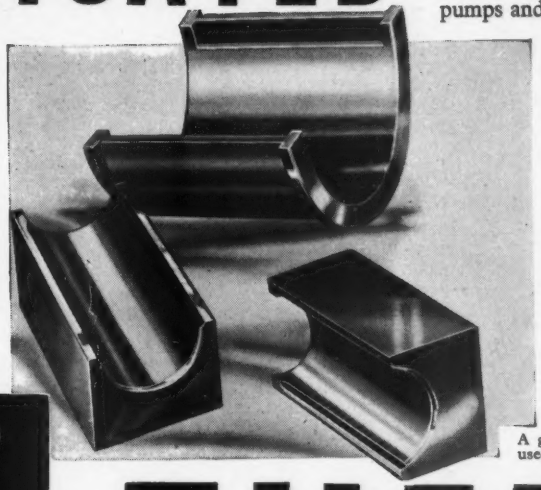

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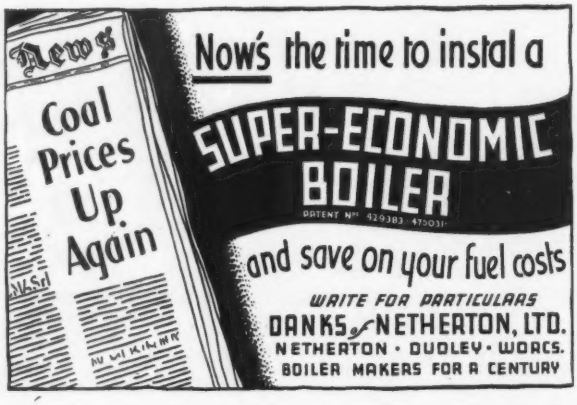
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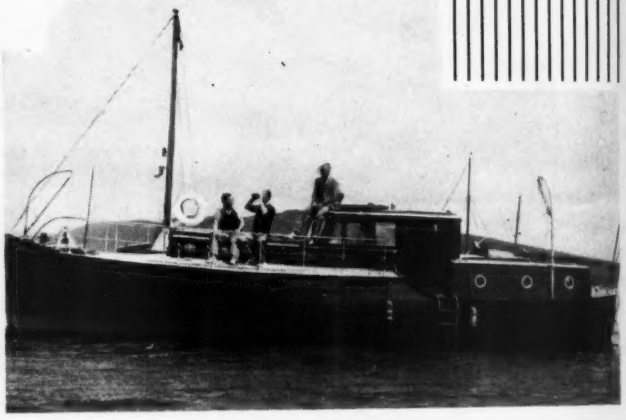

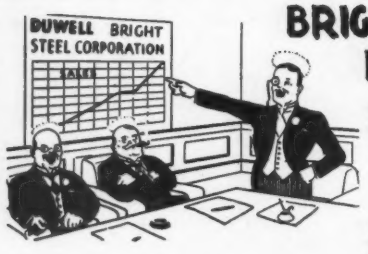

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